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Power wagon

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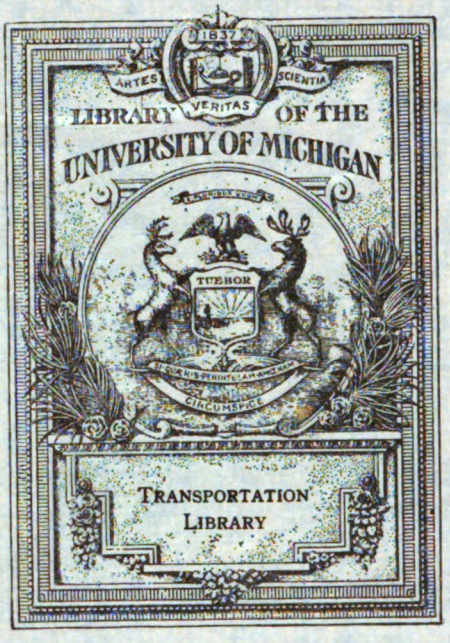

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THE POWER WAGON

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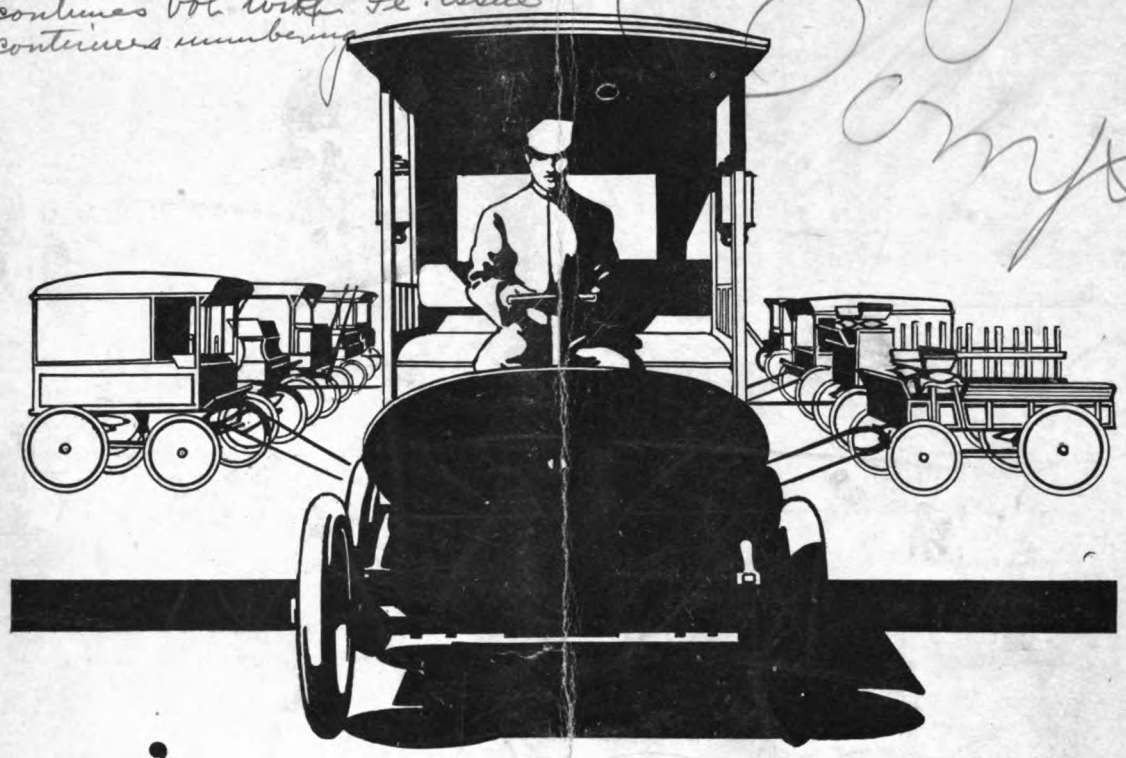

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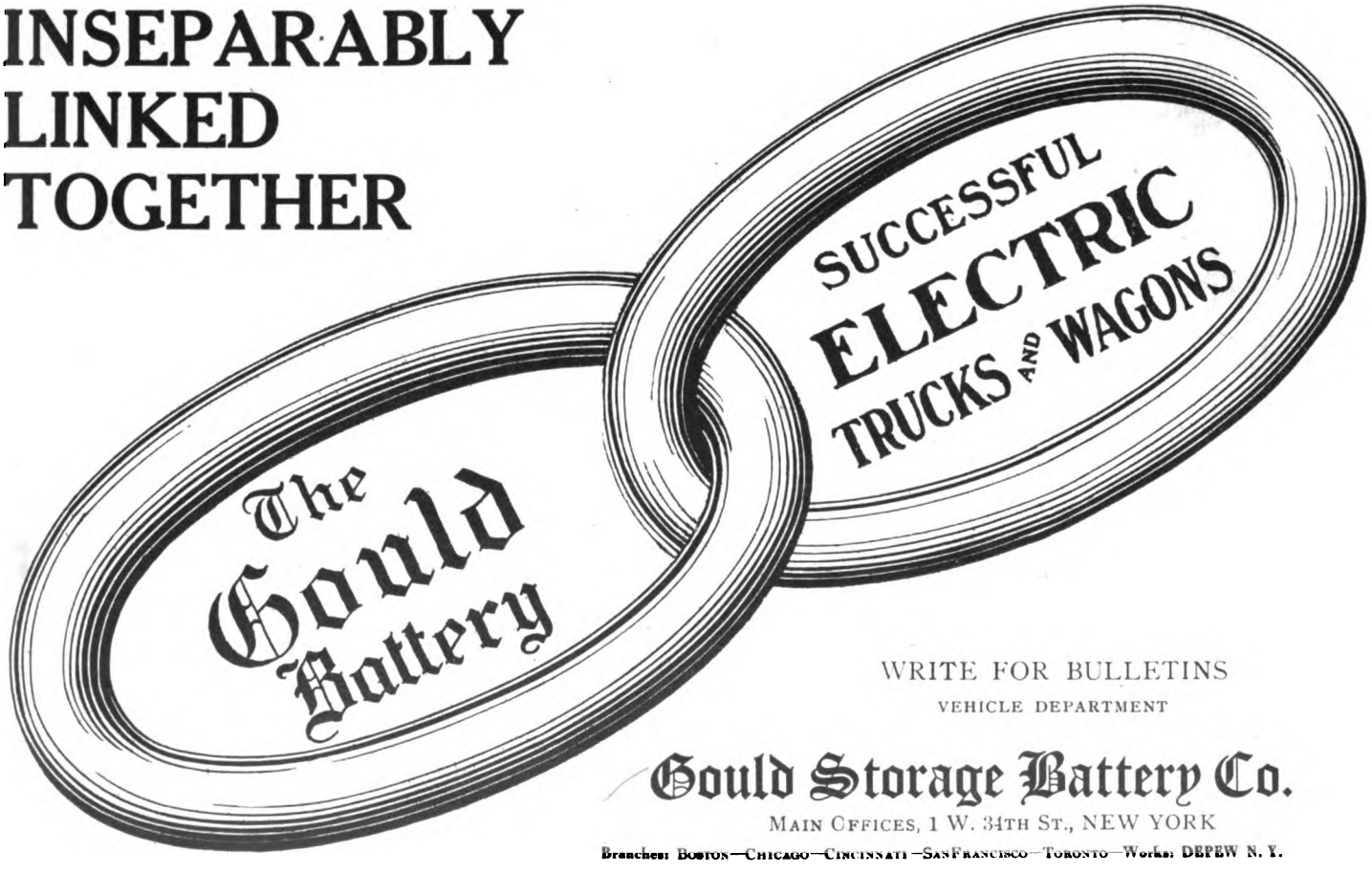

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

VOL. II JANUARY, 1907 NO 5

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WALTER WARDROP, EDITOR

Entered as Second-Class Mail Matter at the Postoffice at Cleveland, Ohio, Under the Act of Congress of March 3, 1879.

Room For The Motor Bus!

Big Public Service Vehicles are Needed to Relieve Congestion In City Passenger Traffic

COMING events cast their shadows before. A while ago nearly every influential daily organ of public opinion, molding its editorial utterances to conform with the exaggerated reports cabled to this country from abroad, was engaged in the unprofitable business of condemning the motor bus in public service. After ignorance, spite and prejudice had done their worst, many of these self same organs, evidently ashamed of the hasty judgment they had pronounced upon these highly deserving vehicles, began to reflect upon its possibilities for service in American cities and not a few now emphatically declare that passenger travel would be greatly benefitted by their employment.

To account for this radical change of front it is necessary to have at least a superficial understanding of the passenger traffic conditions which exist in most of our large cities. In Chicago, New York, Philadelphia, Boston, to select only from among the most important of our industrial centers, the service of surface, elevated and subterranean railways are admittedly inadequate for public needs. Chicago's street railway service, in particular, is shockingly inferior. To bring it up to par efficiency, in the opinion of street railway experts, would require the expenditure of $50,000,000. As the improvements which such a huge sum represents could not become visible for a long time, it is not without reason that the motor bus has been suggested as an auxiliary to the existing service. The noise, the smell, the rattle, the skidding, and all the other loudly complained of evils of the motor bus, could and would be endured if only additional passenger traffic service was provided.

The only form of motor bus known to the daily newspapers of this country is the one against which their shafts of satire and ridicule have been leveled with such persistency—the gasoline vehicle. They apparently are utterly unacquainted with the fact that vehicles operated by steam and electricity, or a combination of gasoline and electricity are in, or are coming into, common use. Evidently, also, they are unaware that the most recent types of the gasoline motor bus are greatly superior to the early types which have caused so much criticism. The modern motor bus, as it issues from a French, German or British workshop, is practically noiseless, constructed according to the most advanced engineering ideas, and well within the specifications which a vigilant police prescribes for vehicles which are expected to ply for gain upon the streets. In short, the motor bus is policed as was never a road vehicle designed for public service. It is, contrary to general opinion, only the old-fashioned machines which excite the horror of transatlantic correspondents and inspire the American public with a contempt for the motor bus.

* * *

The American city motor bus has not yet made its appearance. It is certain to do so, however, within this year of grace. Extensive commercial plans are afoot for making its service available in several of our principle cities. The introduction of the motor bus is not wholly a question of the adequacy or inadequacy of existing street car service. It creates its own traffic. It is, of course, helped or hindered in the development of its traffic by the efficiency or inefficiency of street car service. But the flexibility of the motor bus, its well-known ability to test routes until it has found those which are profitable, practically makes it independent of rail competition. Furthermore, the public, always attracted by useful novelty, insists upon patronizing the motor

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road vehicle whenever suitable opportunity is afforded. Hence the 900 machines in service in London and which, according to verified reports, have transported almost 80,000,000 of people within the past twelvemonth.

* * *

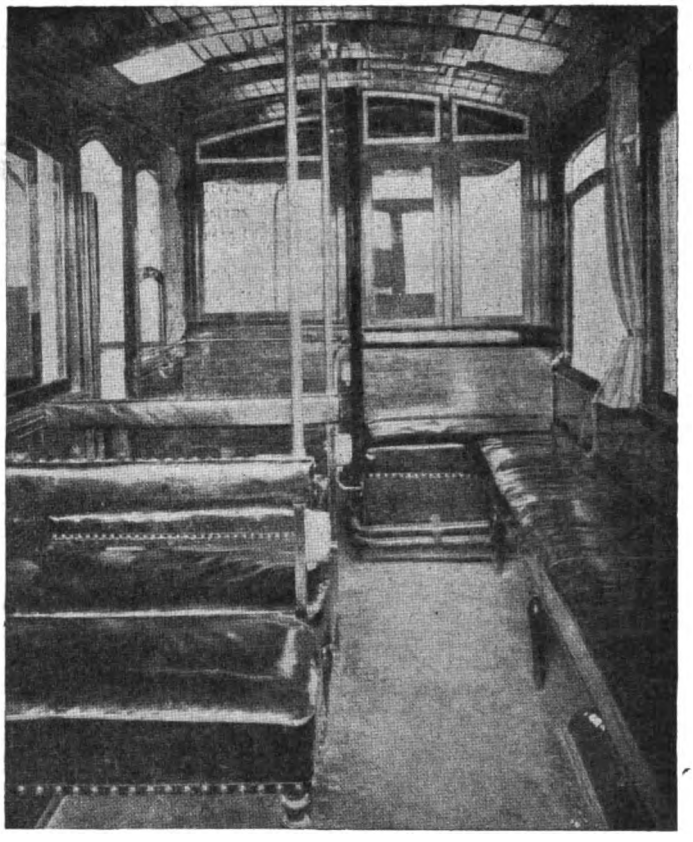
It is a matter of small consequence that a few hundred thousand difficult people, accustomed to look for perfection before progress has had its inning, scream against the noise and ill-smelling emissions of motor buses if 80,000,000 others, not so nice, insist upon patronizing them. Anyhow noise and odor are variously understood. Schopenhauer, for example, had the "jerks" whenever he heard the crack of a carter's whip, and we have the word of a well-known pathologist for witness to the fact that many people sniff at a cabbage and imagine it is the ecstasy of a rose. The permanent noises which assail our ears, like the fixed odors which afflict our olfactories, are sufficiently numerous to give active employment to the reforming aesthetes who would refine commercial practices to the last degree. It is probable that long before we have smokeless cities and clean streets we shall have unoffending public service automobiles. Meanwhile it is well to remember that under the wretched inheritance which has been passed along to us we can safely endure much for a very little gain.

Although no extensive experiment has ever been made in an American city with motor buses for the transportation of passengers, it is safe to say that the very moment they are put in operation they will earn public commendation. The need for them is very great and very obvious. The tendency of population in all large cities to spread faster than the accommodation of surface rail lines is sufficient to justify their employment. Moreover, their service pays handsomely, while the public is afforded a cheap and speedy mode of transportation. It is a fact not generally known that many of the motor bus lines operating in London are not only competing successfully with surface rail lines, but are doing so at a cheaper rate of travel within the same zones of operation.

* * *

Up to date the daily newspapers of this and other countries have been more assiduous in discovering the mechanical faults of the motor bus than searching out its utilitarian advantages. It seems absurd that columns should be devoted to anathematizing the grinding of gear wheels and the exhaust of engines while not a murmur is heard concerning flat car wheels, and the nerve destroying noises which attend the operation of street railways. We are so well accustomed to seeing a street car trolley arm fly its wire and hearing the detonations of an electrical discharge in the same vehicle, that we have come to regard such evidences of imperfection as inevitable accompaniments of public service. The moment, however, a motor bus misbehaves we have yards of type to chronicle its shortcomings.

Very many critics of the motor bus, however, are people who know nothing about its construction, care, operation or management. These arraign every-



Interior of a European Motor Bus.

thing attributable to design—visible exhaust, faulty lubrication, imperfect combustion of gasoline mixture, noise, brakes, side slip, etc.

The system of splash lubrication will in course of time undoubtedly give way to mechanical lubrication and largely correct the objectionable and foul-smelling visible exhaust. As simplicity of construction was indispensable to the design of the first motor buses it naturally followed that the splash method of lubricating engine cylinders was adopted. In this system oil is sucked up from a tank into the barrel of a hand pump by raising the plunger. The tap in the pipe connecting the pump with the tank is then closed, a similar passage leading to the crank case of the engine is opened and the plunger of the pump is depressed. The oil is thus fed into the crank case. When the engine is at work, the ends of the cranks, and the big ends of the connecting rods, dip into the oil, and throw it about on to the cylinder walls and the bearing surfaces.

Now, if the level of the oil gets too high in the crank case, it is likely that some of the oil will work its way past the piston, and, after being burnt by subsequent explosions, will pass out of the exhaust in the well-known bluish haze. If, on the other hand, the oil level falls too low, an insufficient amount will be splashed about. This may very likely lead to serious consequences, such as the heating of the metal at bearing surfaces, which, finally, results in a shaft or pin "seizing" or refusing to turn in its bearing, which means an immediate stop and a lengthy and expensive repair. Under these circumstances, it is only natural that driv-

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ers should at times err on the "right" side, by giving too much.

* * *

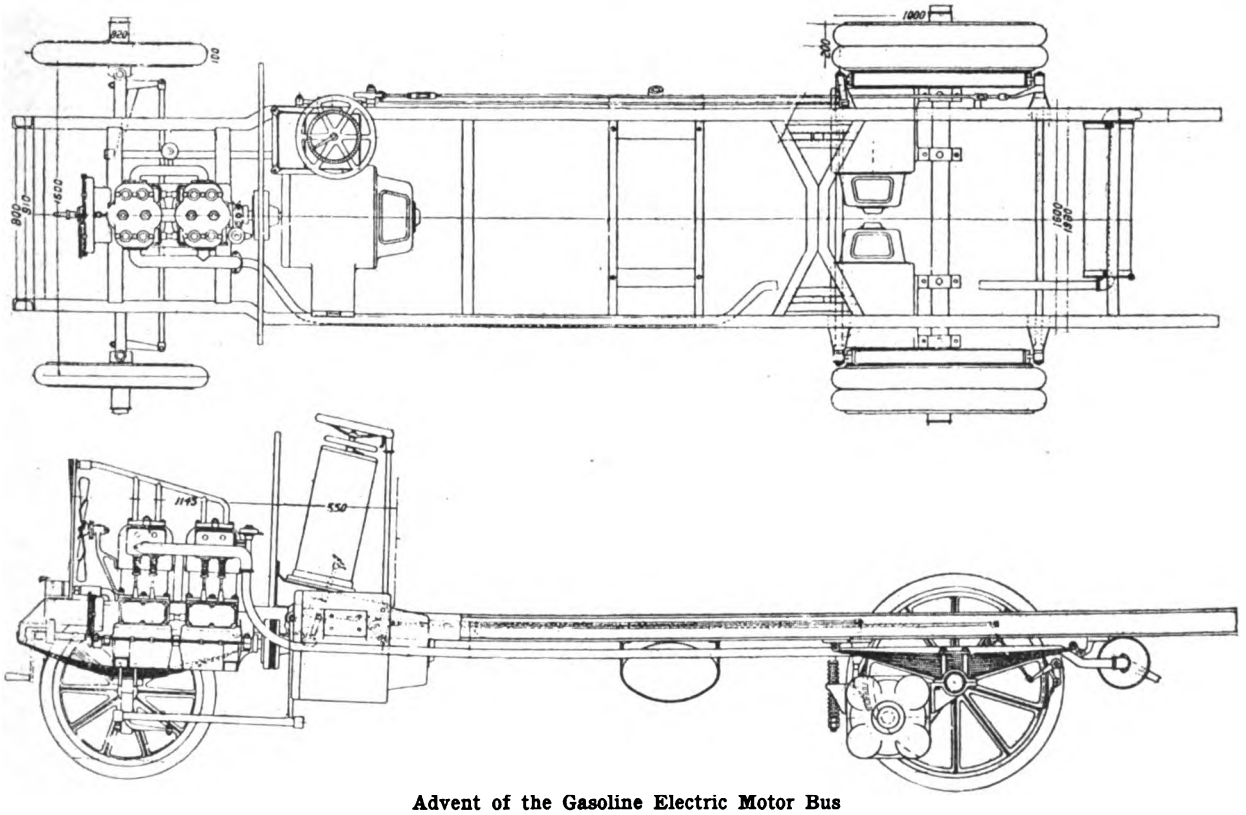
People who don't ride in automobiles or buses—and many who do—complain of the offensive odor of the exhaust which is often due to imperfect combustion of the mixture of gasoline and air in the firing chamber of the cylinder. The carburetter, which is intended to regulate the proportions of this mixture, offers a most complex problem in design. If the mixture is to be perfectly burnt, it must be varied according to different conditions of running and of atmosphere. The automatic performance of all the necessary adjustments of a carburetter to give perfect results has not yet been obtained; but as time goes on improvements are made, and information is collected as to the types which are most suited to motor bus work. A large amount of the experimental work required can only be done in practice, since the conditions of running cannot be in any way exactly imitated.

* * *

Noise produced by motor buses may be due to any of a variety of causes. The engine is necessarily noisy in producing its power, but no difficulty is experienced in muffling its exhaust so as to render it practically inaudible.

In the change-speed gears, the differential gear, and elsewhere, there are toothed wheels in mesh with one another, or connected by chains; and very high-class design, excellent driving, and thorough and skilled maintenance, are required if noise is to be avoided. Especially is this true in the case of changing gears, when one toothed wheel is slid sideways into mesh with another. Unless the wheels themselves are well designed and in good condition, and unless the driver changes speed skilfully, considerable temporary noise must be produced at each change by the edges of the teeth scraping together, while ill-usage and wear increase the permanent noise given out while the wheels are running in mesh.

There has been every reason why imperfections should be very noticeable in early models. Makers must be given time to test various forms of transmission in order to arrive at the best type for a new purpose.



Advent of the Gasoline Electric Motor Bus

MOST of the troubles which beset the gasoline motor bus are attributed to the sliding gear transmission and the present type of clutch. The employment of a gasoline-electric transmission would remove both of these difficulties. Gasoline-electric vehicles were running in 1902 in England, America, France, and Austria, but, though successful as far as being reliable machines, they remained undeveloped commercially. Too much attention was generally bestowed by their designers on attractive fads and complications, and too little on simplifying and perfecting the efficiency of a minimum of well-tried parts. At that time, moreover, the motor omnibus had not attracted the attention of exponents of electric transmission and consequently most systems were judged by their application to touring cars in which they did not show to advantage. The advantage of the gasoline-electric transmission are its silence and flexibility. A vehicle fitted with it can be started by opening the engine throttle, the application of the load being gradual and unattended by wear or strain. The vehicle shown above is now being tested in public service. Seventy-five per cent of the energy developed by its gasoline engine is transmitted through electric motors to the rear wheels. The machine has five forward and two reverse speeds, as well as two electric brakes, obtained by making different combinations between the armatures and field-magnets of the electric motors. The speed can further be altered by throttling and advancing or retarding the ignition of the engine. An indefinite variation in speed range is therefore obtained. The two electric motors are geared direct to the rear wheels. The gears constantly run in oil. As the electric motors run independently of each other, being mounted on the rear axle, no differential gear is necessary.

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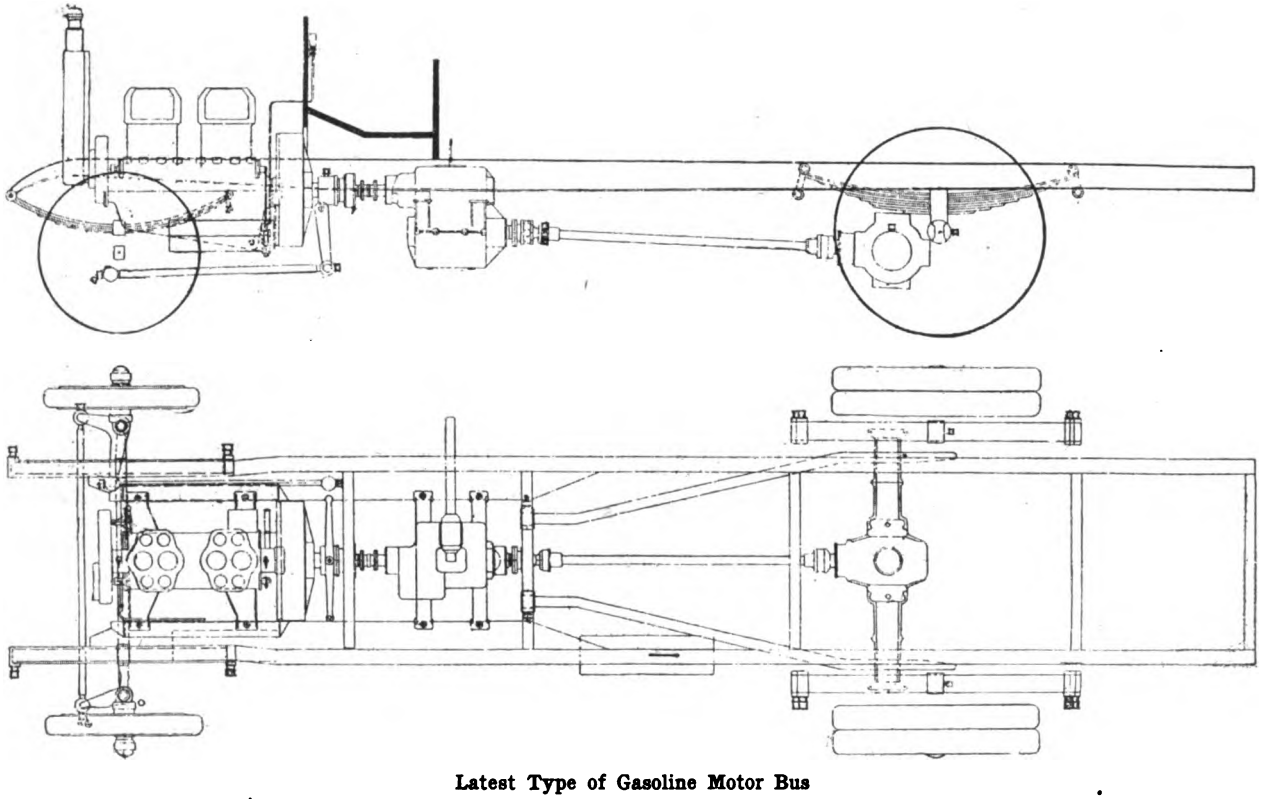
Drivers must learn their work with little enough preliminary training, and almost no previous technical knowledge. Operating and managing engineers and their staffs must gain experience. In a word, the industry must have time to settle down. Even now, new models are being produced, in which noise has been greatly decreased, and next spring will show a still more marked improvement. Designers would naturally, at first, regard the production of an efficient and durable vehicle as of first importance, and with this object in view would consider quietness in operation a secondary matter. Now that they are aware that a quiet vehicle is in absolute demand it will be forthcoming.

* * *

Motor buses will soon be running in Philadelphia in competition with every other form of passenger conveyance if an ordinance, recently introduced in the council, is passed and signed by the mayor. As there is no valid reason why the chief executive should withhold his sanction for the measure, one may go a step forward and state that the first extensive test of the usefulness of the motor bus in this country will soon be witnessed in the Quaker City. The ordinance in question provides for the licensing of motor buses for the period of one year, a fee of $100 being charged for vehicles carrying 20 passengers, $150 for 30 passenger vehicles, and $200 for vehicles with capacity for 40 passengers. Strap-hangers will rejoice to know that a fine of $10 per passenger is provided whenever more fares are carried than the license allows. A seat for every fare, the dream of every citizen and the jest of every street railay magnate, may actually be realized if the stimulating competition of the motor bus is permitted by law. The ordinance further permits as many companies as may desire to compete for patronage. It grants no exclusive privilege.



Latest Type of Gasoline Motor Bus

ELEVATION and plan views of the latest type of London gasoline motor bus are shown above. The vehicle is made in Germany. In its construction very extensive use has been made of superior metal. Frame, cross members, apron, perch bars, and many other parts are made of pressed steel. Crank shaft and cam shafts are made of chrome nickel steel. The male and female members of the clutch are fitted with vane shaped spokes which induce an air current through the bonnet and take the place of a fan. The clutch is operated by a lever lying across the chassis. The end which lies on the left hand side of the vehicle is anchored to an adjustable link, the sliding thrust block which operates the clutch being attached to the middle of the lever. Speeds are 2½, 5, 8½ and 12 miles an hour. The perch bars are set to within 15 inches of each other at the forward end. Formerly these members were made of wood, armored. The frame is 19 feet 11 inches long with 6 inch web at the deepest part. The back springs are made up of 9 plates each 3 inches wide by one-half inch thick. Their length is 4 feet 2 inches. The front springs are 2¾ inches in width and 3 feet 4 inches long, composed of 5 plates each ⅜ inch thick. A feature of these springs is the deep rib that has been pressed in the middle of their section along their entire length. The back of one rib fits into the corresponding hollow of the plate beneath it, and thus the plates are kept from getting crossed. This arrangement offers considerable advantages over the arrangement of making a pin on the under side of one plate fit in a slot punched at the end of the plate below it. The buckles of these springs are made amply large, and the plates are held in the buckles by wedges. All the spring shackle joints, (as well as steering gear joints) are fitted with grease cups. The bearing surface of the rear axle is 8⅞ inches long, with ends 3 inches in diameter. The front axle gives a bearing surface of 6¾ inches by 2¼ inches and is made of H section. The differential is placed with its axis longitudinal to the frame, instead of transverse to it, as is usually the case. The external and internal brake drums are water-cooled.

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The Auto Transit Company, formed with a capital stock of $1,000,000 to operate electric buses seating 30 passengers, was one of the first concerns to apply for a license. This company proposes to operate 30 vehicles all of which will be driven by independent electrical units in each of the four wheels. One of the first lines it will put in operation will be on Broad street, which will at once relieve the congestion of that thoroughfare. Another projected route will extend from city hall to the parks. Other routes are being mapped. A fare of five cents will be charged.

Public opinion is almost a unit in favoring the employment of the motor bus in Philadelphia. The street railway service is not nearly adequate for the population. The cars are slow running and too few in number, and the company operating them is without the money, and apparently without the disposition, to purchase new cars, or operate the old ones on fixed or fast time.

* * *

In Chicago the idea of employing the motor omnibus in public service is yet to be hatched out. Thus far there has been more talk than action. It is instructive, however, to observe that the interests which less than a year ago ridiculed the pretensions of the vehicle are to-day loud in their praise of it as the one instrument by which the existing passenger traffic congestion can be speedily relieved. One constantly encounters in the pages of the most influential papers such statements as the following:

Any kind of a motor bus line, either on the north side or the west side, will pay these days. People cannot get on the street cars, and they will pay double fare to be brought down-town by motor buses. There is money to be made for several years to come by operating omnibuses in this city, because it is evident that years must elapse before street railway traction systems can be made adequate for the handling of traffic. Motor bus lines ought to make their projectors rich.

* * *

Chicago's leading daily newspaper, the Tribune, voices the public's uneasy state of mind over the present condition of city travel when it says:

The better air afforded to passengers is but one of the attractions of the autobus which comes up to the curb to take on a passenger and is not confined to any definite part of the street. From many points of view it has distinct advantages over a street car, which must keep to the rails and is accompanied by objectionable features, such as the presence of the trolley either overhead or underground, the disturbing element which the rails make in the street itself, and the necessity of adhering to certain definite routes of travel. In the average American city the autobus should prove a strong competitor of the street cars.

There must be a satisfactory pavement to insure pleasant riding in an autobus. American cities are far behind in this respect. The pavement in the heart of the business district, where there is constant traffic, is quite likely to be disgracefully bad. Contractors are permitted to make asphalt roadways which soon become filled with chuck holes which would be discreditable on a country mud road. Cedar blocks are poorly placed, making it possible for a "new" street to become useless for traffic within a few months. Granite blocks are laid in such a way as to make riding over them little short of torture. A fine street from Englewood or Evanston or Austin to the loop district might afford a splendid highway for an autobus. But such streets do not exist, and there are few extended districts in Chicago where such a system of transportation could be used with any satisfaction.

On the other hand, there are many places where the street cars run on the only paved part of the road. They have some advantage in having a franchise, and the rails afford the only means of carrying thousands to work and back home again. It is apparent that a method of travel, restricted as street car traffic is by the need of following the rails is not the fullest development of freedom of movement. If conditions were right men of means might well hesitate to invest large sums of money in "permanent" improvements of such proporties in view of the success of the autobus.

* * *

In studying passenger traffic in any of our large cities the first thought which occurs to people accustomed to the idea of making the automobile available in public service, is the slowness of the street railway operators to grasp the significance of the motor bus and motor cab movement. To-day it is possible for the street railway companies to practically monopolize all forms of city transportation. To-morrow, when speculative capitalists, tempted by the rich rewards of motor bus operation, compete with existing street railway companies for public patronage, it will be too late to recover the lost ground. In the past street railway franchises have been capitalized for millions; in the future motor bus franchises will be quite as valuable.

Some years ago, when interurban trolley lines began to parallel existing steam railway lines, the operators of the latter resolutely refused to believe that the former could injure their business, or take away trade from them. Now, however, we find one of the lieutenants of Mr. Harriman remarking, with unctious satisfaction, that "in the gasoline rail coach the steam railroads have found the perfect defense against the competition of electric railways." One wonders what is the "perfect defence" of the street railway company whose inadequate service has caused it to forfeit the good will of the public.

CHEAP MOTOR BUS FARES

MOTOR bus fares in Berlin are very low. The company operating these machines recently made propositions to the municipality, which were accepted, regarding a uniform rate of 10 pfennigs ($0.025) for all distances of the route. This rate is exceptionally low, seeing that all the new omnibus lines which have been put in operation have a length of over three miles. Some of the lines are nearly four miles long. Only the Schlosspart-Charlottenstrasse line is an exception as to length, seeing that it is not more than one and one-half miles in length. In this case the rate will be $0.038 for the whole distance of the line and $0.025 for fractions of the distance.

Four motor cab companies are already carrying on operations in London, and they have placed at least 100 vehicles on the streets. The latest organization recently signalized the arrival of its first consignment by a grand parade of forty landaulettes. The vehicles can be secured for the day, week, or month. Of 14-16 hp. they are capable of doing 200 miles per diem if necessary.

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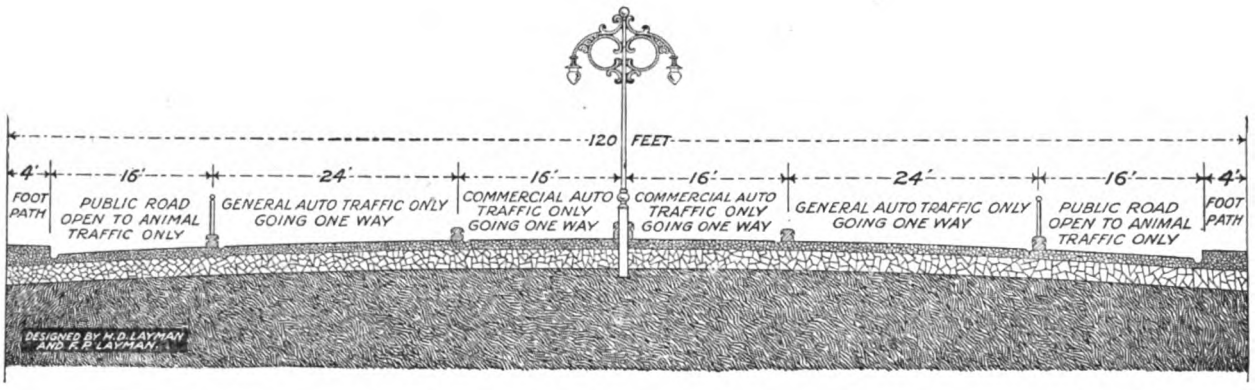

Sectional View of Ideal Highway.

Ideal Commercial Highways

Presentation of a Plan Whereby They May be Speedily and Cheaply Constructed

HOW much of the roadway of the future will be given over to draft animal traffic, how much to automobile traffic, and how much to pedestrians, are matters which few would have the courage to pronounce upon unless a strong personal interest lay back of the predictions.

An engineering firm in Chicago, which has copyrighted designs and specifications for a new system of public roads and highways, and evolved a plan by which they can be built and equipped as private enterprises before being finally delivered to the public, considers that the following division would be equitable: Total width of roadway, 120 feet; portion open to animal traffic, 32 feet; portion open to industrial motor vehicles, 32 feet; portion open to automobiles used for pleasure, 48 feet; footpaths for pedestrians, 8 feet.

* * *

A cross sectional view of this ideal roadway is shown at the top of this page, from which it will observed that traffic in the spaces allotted to the several types of vehicles is only to be permitted to flow in one direction in any given division of the highway. The various sections of the roadway are divided by curbs of concrete. The road surface may be of any proved material best suited to the nature of traffic and climate. Stations for the supply of fuel and power for automobiles are to be located at regular intervals along the highway, and suitable provision is made for overhead passenger crossings, surface railroad crossings, etc. Telephone, telegraph, repair stations, and all other conveniences necessary to public comfort and welfare, are also part of the plans for the establishment and maintenance of these commercial highways.

The purposes of the projectors of this novel system of road transportation are to establish roads and highways best suited to public necessities, and at the same time so plan and safeguard the entire enterprise as to enable it to become public property at the earliest practicable moment and at the least possible expense; to create broad channels for competition in transportation, and to link more closely the country with the city, —in short, to provide highways best suited to an advanced civilization. It is not the pupose to conflict with, or in any way retard, the widespread movement for the procuration of good roads, but rather to give it force by defining their utilitarian purpose.

* * *

With a capital stock of $500,000 the Commercial Highway Company, an organization which has purchased the copyright of the aforesaid engineers, proposes to build roads in accordance with the design just sketched. This company aims to secure options on, and subsequently purchase, real estate along selected lines of travel, so that the increase in market value, owing to contemplated improvements, will be more than ample to pay for the construction and equipment of the highways. To purchase this real estate the company hopes to issue bonds which will be secured by its entire property. When a highway has been built, and sufficient revenue obtained from tolls and sale of real estate, the bonds issued for its construtcion will be called in, and the highway shall become the property of the state in which it is located without further consideration than that the road shall at all times be kept open for public use, and that no toll charge shall be made for transportation over it, other than what will be necessary to keep it in a proper state of repair. The company's hopes of making money through the rise in real estate values would, no doubt, be materialized if the proposed highways were constructed. A similar idea has often been discussed in automobile clubs which have been led to consider the construction of special roadways for motor vehicle use.

* * *

Another interesting feature of the company's programme concerns the division of profits from the sale of real estate adjacent to the lines of travel. It is provided that 75 per cent of the net receipts from the sale, lease or rental of the real estate owned by the company, in connection with the highways built shall, after the payment of all obligations, and the delivery of the roads to the state, be devoted to the building and maintenance

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of industrial schools. It is expected that the natural increase in the value of the real estate which will be purchased along these proposed lines of highways before and as a condition to the building of the same, will not only pay the cost of construction, but leave a considerable amount of valuable property to maintain industrial schools (along or near these highways) of such character as will afford advantages of permanent value to those unable to enter the high-priced colleges—schools which will equip men and women for industrial pursuits as well as business careers. The disposition of the 25 per cent of excess in real estate values, not heretofore provided for, will go to the company.

BIDDING FOR A MOTOR HOSE WAGON

THREE firms submitted bids for the construction of a motor hose wagon for the Hartford, Conn., fire department, the specifications for which vehicle called for an air-cooled engine of not less than 20 hp., two speeds forward and reverse, 34-inch wheels, 4 1-2 inch solid rubber tires, 56-inch tread, two 35-gallon chemical tanks and equipment and a body large enough to carry 1,000 feet of the usual 2 1-2 inch fire hose, two short ladders, various tools and other things. None of the three proposals came up to the requirements. The price was to be given f. o. b. Hartford. The appropriation is $4,000.

The Logan Construction Company of Chillicothe, O., offered to furnish a four-cylinder air-cooled machine, built and equipped according to advertisements of the board, for $2,850, f. o. b. Hartford.

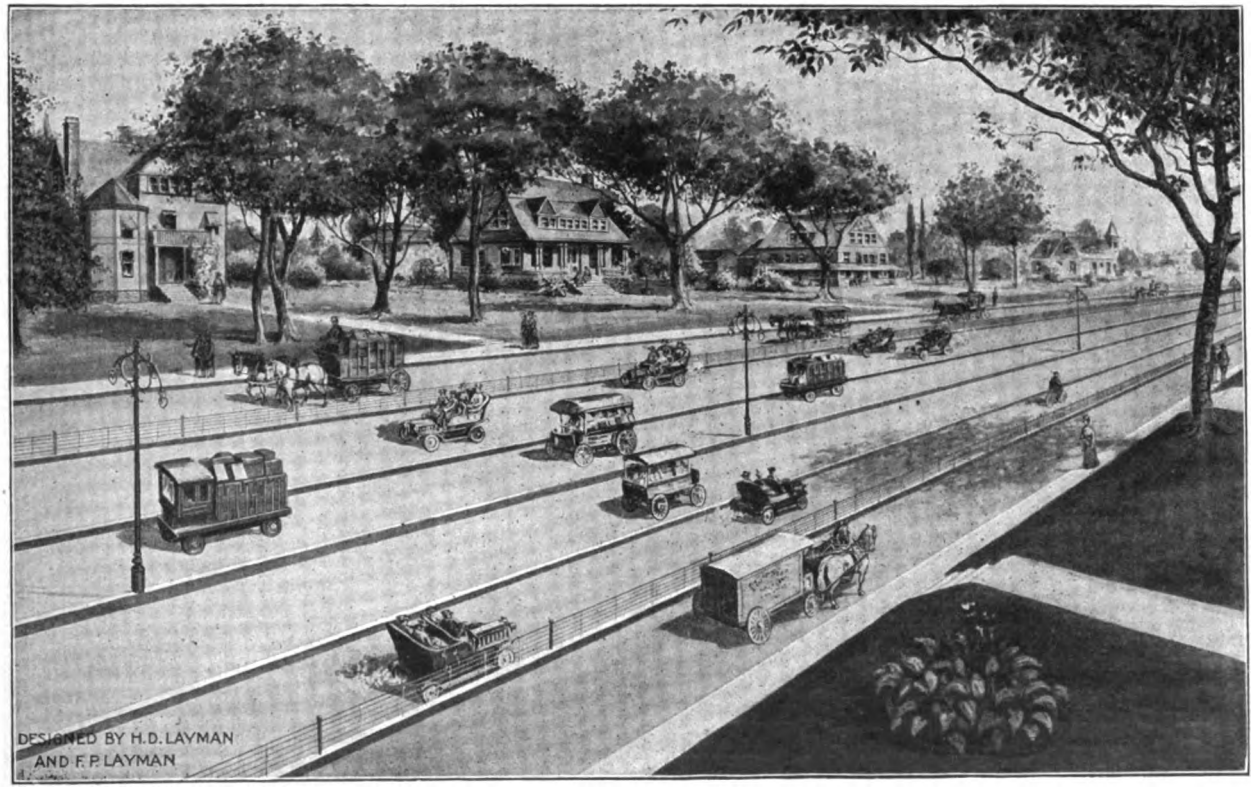
The Knox Automobile Co. of Springfield, Mass., offered a two-cylinder air-cooled wagon, equipped with 30-gallon tanks, delivered 90 days from order, for $4,300 f. o. b. Springfield.

The Robinson Fire Apparatus Manufacturing Company, of St. Louis, presented an unsealed proposal, after the others had been read in the presence of its representative, for a wagon to be delivered 90 days after order, f. o. b. Hartford for $4,850.

MEISELBACH COMPANY REORGANIZED

THE A. D. Meiselbach Motor Wagon Company has been reorganized, financially strengthened, and additional factory quarters have been secured for the company at North Milwaukee. The following business men have become interested in the concern: Henry G. Rogers, S. S. Newton, Byron R. Godfrey, J. C. Crawford and C. J. Luther. Officers have been elected as follows: President, A. D. Meiselbach; vice-president, Henry G. Rogers; secretary and treasurer, B. R. Godfrey, North Milwaukee. The company will build one-ton, two and three-ton motor wagons, and will erect one complete machine a day. The capital stock of the new company is $50,000.

Six motor buses will be employed in making the circuit of Belle Isle, Detroit, next year. The rate of fare will be three cents to cross the bridge and fifteen cents around the island. Three of the vehicles will accommodate forty passengers each and the other three will seat twenty passengers each. It is planned to widen the sidewalk in front of the waiting room at the Jefferson avenue entrance to Belle Isle bridge and to construct a platform for use in connection with the machines.



View Showing the Flow of Traffic in the Various Sections of the Ideal Highway.

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Overriding Opposition

The Postmaster General Overcomes Objections to the Employment of the Motor Vehicle

THE introduction of the motor wagon into postal service is not being accomplished without opposition. The chief executive of this important division of government and his able first assistant clearly perceive the necessity for supplanting or supplementing horse-drawn vehicles with the speedier and more economical machines. In their campaign for an improved mail collection service these progressive administrators have easily won the co-operation of every alert postmaster in the country. But, unhappily, their zeal in the public's behalf has earned them the hostility of a small but powerful group of bureaucrats in Washington who look upon administrative change of any sort with extreme aversion.

These bureaucrats are tenacious of old customs. They oppose change of method from shere force of habit. A change is dreaded for the reason that it entails or is likely to entail, increased expense in the beginning. The introduction of anything new is bitterly fought by the fossils in the service, with which, under civil service rules, the department is barnacled. They fit into such methods perfectly and comfortably, and abhor a change as nature abhors a vacuum.

By these superserviceable guardians, when the first assistant postmaster general some months ago proposed to introduce automobiles into the service for the more rapid movement of the mails in large cities, he was told that there was no authority in law for the purchase of automobiles. Inquiry soon developed the fact that the appropriation for "horse hire" was drawn upon for the purchase or hire not only of horses, but of wagons, carts and other vehicles for the movement of the mails, and he soon thereafter confirmed the objections with the question: "If you can buy wagons, pushcarts and other things with 'horse hire,' why can you not buy automobiles with the same fund?" For obvious reasons no reply was forthcoming, and the automobile will soon appear in some of the larger cities as a "hurry-up" addition to the distribution and delivery of mails.

The opposition to the employment of motor wagons, however, is more irritating than important. It has been battered down by a just presentment of the public economy to be derived from the use of the machines wherever their service has been reasonably shown to be desirable. Unreasonable prejudice is not to be permitted to interfere with the needs of good government.

For many years the term "horse hire" has represented a very large sum in the expenses of the postal department. It is well known that this term though the bills were audited under that name, has meant any means of transporting the mails from place to place in the large cities, except motor vehicles. While business men have for a number of years been using motor wagons with profit, the postal service, a most indispensable auxiliary of business, has continued to transport the enormous bulk of mail in large cities by means of horse-drawn wagons, many of which in their clumsy, ramshackle condition bid defiance to speed in delivery.

Plainly stated, the postal department has made "horse hire" the basis of its movement of mails in large cities, regardless of the convenience of the rapidly progressing business world which has pressed the automobile into its service. "Speed" is, however, the motto of the postal department under the present administration. Upon the basis of securing increased speed in movement of the mails in bulk at the central offices, and their distribution at sub-stations, the department has been practically reorganized in the last two years, and the introduction of the promised automobile into the problem is the climax of endeavor now awaited.

"It is our business to keep the mail moving, and moving fast," said the First Assistant Postmaster-General recently, adding: "We should study economy of time. It is the business of the postal service not only to deliver mail, but to deliver it as promptly as possible. As far as this can be done, the work of the department should be conducted upon a modern business basis."

This utterance may be taken to signify that in all branches of city and rural mail service now dependent upon horses and wagons the motor vehicle is to become the chief agent for transportation.

COSTLY HOTEL MOTOR BUS

THE hotel motor bus is in big demand, particularly among proprietors of hostelries which are not conveniently located to connect with railroad depots by street car lines. As the machines can be made to pay, money is not spared in their construction or equipment.

The Hotel Schenley, of Pittsburg, has just purchased a $5,000 bus, with 50 hp. engine and carrying capacity for 12 passengers and baggage. The route for the bus will be over the Grant boulevard, which is asphalted. The bus will make the run from the union station to the Schenley in ten minutes, bringing the hotel as close to travelers as the down-town hotels. Upon writing or telegraphing the bus will meet any train at the union station. The difficulty in the past has been how to reach the Schenley with comfort and at the least possible cost. It is expected that one bus will not be sufficient to handle the business; if this should prove to be so, another will be purchased for this special work. The charge per passenger will be 50 cents; light baggage will be carried without any extra charge.

Four of the eight rural mail routes out of Sequin, Texas, will shortly be served by automobiles.

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Public Service Regulations

Official Instructions Which Govern the Construction of Motor Buses and Cabs

THE operation of public service motor road vehicles is now so common abroad that the police authorities, under whose jurisdiction they are permitted to ply for trade, have found it necessary to formulate the following regulations for their construction:

1. Motor vehicles must be submitted for inspection in a thoroughly good condition, and no vehicle will be certified fit for public use unless it is newly painted and varnished.

2. Each new type of motor car intended for licensing must be presented at police headquarters for inspection. The proprietor must at the same time produce the certificate of registration, and also one from the maker stating the machinery to be safe and in every way fit for use in a public carriage. If, after inspection, the car is approved, such approval may extend to all cars of that description, and cars of that type need not be again presented but may be taken to the usual passing station, provided a certificate from the maker is submitted with each car for licensing, stating that it is in every respect similar to the type already approved. A certificate from the proprietor, stating there has been no alteration in the design of the machinery since the previous inspection and date covered by the maker's certificate, must be presented with each car submitted for renewal of license. Should an alteration be made, the same course may be required as for a first inspection. Should it be deemed necessary, an expert will be employed to advise on the subject. The fee for the expert examination to be disposited by the proprietor with the commissioner, which fee will be returned if the car is passed without alteration being required

3. The following measurements and requirements for a hackney carriage should be adhered to:

Chassis. Wheel-base should in all cases be so proportioned that skidding or other improper movements shall be as far as possible avoided.

(NOTE.—The Commissioner reserves the right, even after a car has been passed, if it is found to be apt to skid unduly, to issue a notice on the proprietor not to use, and may refuse to license again until the defects have been remedied.) The springs must be properly hung, of sufficient strength and flexibility, to meet all purposes which may be required of them. Those springs carrying the load must be attached to, or bear upon, the back axle, as near to the wheels as possible; the distance between the outside of the rear springs shall not be less than 40 in. The front springs must be as wide apart as possible, but not less than 26 in. from outside to outside. Center of wheel track must not be less than 4 ft. 4 in., and in no case must the front be less than the rear. Height inside, from the top of seat cushions to the roof at the lowest part, or, where the front window frames fold up toward the roof to the lowest part of the frame, must not be less than 40 in. Width inside at any point must not be less than 40 in. Width from the back squab to the nearest point of door pillars must not be less than 26 in., and for knee space not less than 28 in. Height inside from the top of seat cushions to the roof at the lowest part, must not be less than 40 in. Width between the hinge pillars or shutting pillars must not be less than 40 in. Width of door must not be less than 21 in., and the door must be so constructed that it opens to the fullest extent and causes no inconvenience to passengers. Where the carriage is provided with front and back seats, the measurement between the front edges of cushions must not be less than 19 in. Width of front seat not less than 14 in., and of back seat not less than 16 in. There must be a hand-rail, commode rail, or other suitable means to assist passengers entering and alighting, and it must be properly and rigidly fixed. The total overall length of the chassis and body must in no case exceed 14 ft., nor the extreme breadth be greater than 5 ft. 9 in.

4. Each carriage must be fitted with at least two independent brakes of sufficient strength so that either of them shall be capable of stopping and holding the carriage under all conditions. They must also, where necessary, be fitted with a compensating device.

5. The brakes should as far as possible be so affixed as to be capable of easy adjustment and at least one must be so made as to be applied by the foot of the driver. No two brakes which operate upon the same part will be considered as "independent," and at least one should act directly upon the road wheels without any connection with the propelling gears. NOTE.—The maintenance of the brakes in perfect order is of the utmost importance, and this will at all times be insisted upon. They will at any time be subject to inspection.

6. Each car must be capable of being readily steered and able to turn on each lock, and proceed in a contrary direction within a roadway not more than 25 ft. wide from curb to curb.

7. The steering arms and connections must be of sufficient strength, and as far as possible protected from damage by collision.

8. All brake and steering connections secured with bolts must have such bolts fitted with nuts, the same to be locked or pinned. These parts will be subject to inspection at any time.

9. The machinery should be so constructed that no undue noise or vibration is caused, and the maintenance of the carriage in this condition will be strictly enforced.

10. All parts connected by bolts or studs and nuts subject to severe vibration must be fastened by lock nuts or by nuts and approved spring or lock nut washers, to prevent their working loose and making a rattling noise, and any carriage with lamp brackets, mudguard brackets, and other carriage fittings loose and likely to cause unnecessary noise, will be regarded as unfit for use in public service.

11. Carburetters must not be placed in close proximity to magnetos or to connections of wires carrying electric current, except they are suitably encased or screened.

12. Effective means must be adopted for preventing the heat of the motor or of the exhaust pipe connections from injuriously affecting other parts of the carriage or the comfort of the passengers.

13. All wires carrying electric current must be properly insulated and protected from injury, and so placed that they cannot be the cause of danger.

14. Tanks for gasoline or other liquid fuel must be made of suitable material, properly constructed, and of sufficient strength. They should be so placed that any overflow shall not accumulate on woodwork, or where it can be readily ignited. The filling nozzle or inlet for the gasoline or other liquid fuel should, where possible, be brought to the outside of the body.

15. When a guard or tray is fixed underneath, it must be so constructed that any overflow of gasoline from the carburetter shall not be retained in the tray.

16. The machinery must be so constructed or placed that oil from the bearings shall not be allowed to drop on to the roadway. When trays are fixed to prevent this they must have suitable webs for retaining the oil when ascending or descending hills, or be otherwise suitably constructed with that object, and oil must be cleaned out frequently, and not allowed to accumulate from day to day.

17. The lubrication of the engine or the carburation of the working mixture, must be so controlled that smoke is not projected with the exhaust, or from any other part. This will be insisted upon at all times.

18. The outlet from the silencer should not be so placed as to project the exhaust directly on to the roadway, or so placed, or so directed as to alarm horses immediately behind the vehicle.

19. Every vehicle must be provided with, and maintain in use at all times, an approved means of preventing or limiting side-slip.

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20. A horn or gong, or other approved means of giving due warning of the approach of the vehicle must be provided.

21. Driving chains and sprockets must be protected by a suitable guard.

22. Head lights of great brilliancy will not be permitted.

23. Each carriage must have a check string or some other means of communication between the passenger and the driver.

24. The number of passengers which the vehicle is licensed to carry must be legibly painted on the back of the carriage outside.

25. Where acetylene or other gas is used to light the carriage, the cylinders or vessels which contain the gas, or in which it is generated, must be fixed outside in such a position as to be removed as far as possible from the danger of accidental ignition.

26. Straps with holes must be placed on the window frames (where considered necessary), and metal or bone knobs must be fixed inside the carriage, to enable the windows to be partially closed.

27. When drop windows to hansom pattern bodies are used, they must be so constructed that they may be raised both by the driver and by the hirer in such a manner as not to cause inconvenience.

28. Carriages, the floors of which are above 18 in. from the ground, must have suitable steps, and suitable commode rails for the convenience of passengers.

29. Provision must be made for the safe conveyance of a reasonable quantity of luggage.

30. The floor must be covered with mats of rubber, coir, or of some other suitable material.

31. No printed, written or other matter shall appear on the inside or outside of the carriage, or be carried by way advertisement.

32. No celluloid or xylonite fittings shall be placed inside or outside the carriage, but this does not apply to the inside of the accumulators.

33. There must be proper ventilation without the necessity for opening the windows.

34. Some effectual means must be provided to prevent the rattling of window frames and glass.

35. A lamp must be fixed on the right or off side of the carriage, and another at the rear to provide for the illumination of the identification plate.

36. The cushions of seats, where such are provided, must be covered with leather, cloth of good quality, or other suitable material, and not stuffed with hay, straw, seaweed, or whalebone shavings. Inferior American, or a similar cloth or any material of inferior quality, is not regarded as suitable for public carriages.

37. The doors, windows, seats, roofs, springs, wheels, cushions, linings, panels etc., and all furniture and appointments of the carriage must be in proper order and repair, the paint and varnish in good condition, and the inside perfectly clean.

NOTE.—Though the above conditions may have been complied with, yet, if there be anything in the construction, form, or general appearance which, in the opinion of the Commissioner, renders the carriage unfit for public use, it will not be licensed.

A PERFECT DEFENCE AGAINST COMPETITION

OFFICIALS of the Harriman lines are much gratified with results obtained from the use of gasoline motor rail coaches for passenger service on branch lines, where the use of passenger trains drawn by steam engines proved expensive and unsatisfactory. J. Kruttschnitt, director of maintenance and operation of the Harriman lines, says:

"We now have in service six gasoline motor cars, and are building ten more. Last month these cars made 490 trips, with a record of making schedule time or better on 97 1-2 per cent of the trips. Few trains drawn by steam engines can boast of so good a record.

"Some time ago Mr. Harriman asked, 'Why can't we adapt the automobile to our tracks?' I believe we have solved the problem. W. R. McKeen, Jr., superintendent of motive power of the Union Pacific, designed our cars and motors.

"In the gasoline motor car I believe we have found a perfect defense against electric lines which have invaded our territory. Our latest type of car seats seventy passengers, and in every way performs the service required better than trains drawn by locomotives."

Houston and several other Texas cities figure in the plans of a group of capitalists who are investigating the commercial possibilities of suburban motor bus service throughout the state. They believe light freight and express could be carried on the vehicles to supplement the revenue from passengers.

MOTOR FIRE ESCAPE WRECKED

DISASTER has overtaken the electric fire escape used in Schoneberg, Germany, and illustrated in a recent number of this paper. The vehicle was wrecked against the curbstone after an ineffectual endeavor to avoid a collision with a street refuge. The driver was killed.

The official report of the accident states that the driver failed to notice a street refuge until it was too late, and, through the abrupt movement of the steering wheel in endeavoring to avoid it, made the escape skid on the street car lines and greasy road. The front part of the vehicle cleared the curbstone, but the rear portion struck it violently, and the top-heavy escape turned over. Schoneberg's self-propelled fire engine, which was following in the wake of the escape, was stopped in the nick of time to prevent a second smash-up. The escape was supplied to the corporation at the beginning of the year by a Nuremberg firm at a cost of $5,000.

As a result of the employment of motor buses the mail and passenger service between Knoxville and Sevierville, Tenn., will be greatly improved within the next thirty days. The trip, now requiring about six hours, will be performed in two and one-half hours.

The fire department of Wheeling, W. Va., is convinced that motor driven chemical engines are more economical and effective than those drawn by horses, and is urging the city authorities to sanction their purchase.

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To Prevent Side Slip

Devices Designed to Make Heavy Motor Vehicles Immune From This Evil

WITH the object of discovering a device which will effectually prevent side-slip and skidding of heavy commercial motor vehicles, and which will resist wear and tear sufficiently well to justify its employment, a continuous service test covering 1,000 miles is being arranged to occur this month. This is not to be a fair weather test, in which road and street conditions will be advantageous to the devices, but a trial of the severest kind to determine effectiveness, durability, simplicity of construction, ease of attachment and detachment, effect on roads and tires, absence of noise, absorption of power and resiliency.

Although hundreds of anti-skidding devices have been invented few have been commercially tested. The majority of non-skidding appliances are so obviously ineffective that it has not seemed worth while to experiment with them. Of the various devices which are in more or less common use we propose to give some account. None is wholly satisfactory.

* * *

One of the most satisfactory devices, inapplicable, however, on asphalt or similar hard surfaces, consists of a tripod of steel attached to the rear axle in such a way as to trail behind. The two side supports are in front of the third leg, which is the trailer and is considerably

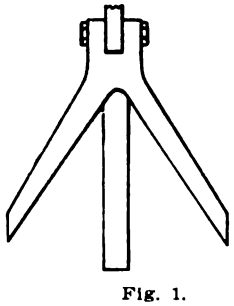

Fig. 1.

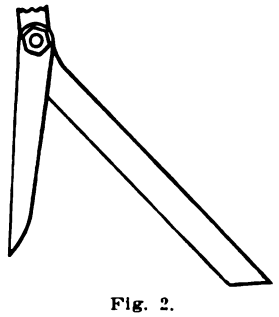

Fig. 2.

longer than the other two. This device, illustrated in Fig. 1, will not "bite" into a hard surface. Another objection to its employment is the noise it makes in action.

Another device of this order, Fig. 2, which has been used with limited success consists of two blades fixed at an angle, one on each side of the vehicle. When a tendency to side-slip occurs one of the blades digs into the road surface along the entire length of its edge. On asphalt (and we understand this invention is effective on such pavements) the depth to which the blades dig in is a neglible quantity. On unpaved roads, however, its action is distinctly objectionable, and militates against its extended adoption.

* * *

There are innumerable tire forms for the prevention of side-slip. One, illustrated in Figs. 3 and 4, consists of a massive rubber band held between the felloe on the inside and a steel ring on the outside. The circular band is made in one with the solid circular blocks that stud its outside circumference. The outer steel ring is drilled so that the blocks may pass through the holes and project beyond the circumference of the steel rim, and permit all the rubber blocks to project beyond the outer circumference of the steel rim. On the inside of the band the projecting blocks are hollowed out, and it appears to be due to this fact that the blocks exert a sucking action and so prevent side-slip. With reasonably good driving, it is said, no side-slip will occur from the use of this tire on the greasiest asphalt—the severest of all practical tests. The disadvantage of this tire is that too much power is required to start a vehicle fitted with it, a waste, however, which its makers assert is balanced by its efficiency at high speeds.

* * *

While the twin solid rear tire undeniably exerts a marked tendency to overcome side-slip it does not by

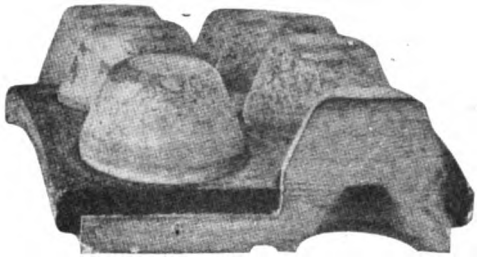

Fig. 3.

any means wholly succeed in doing so. Hence the device shown in Fig. 5, which consists of segments of leather of three or four thicknesses riveted together, placed in the groove between the twin sections of rubber, and secured to a metal base or ring. This leather piece is pressed on to the wheel in the same way as the tires. It is probable, however, that the leather will become spongy, and consequently ineffective, the idea being that it should wear

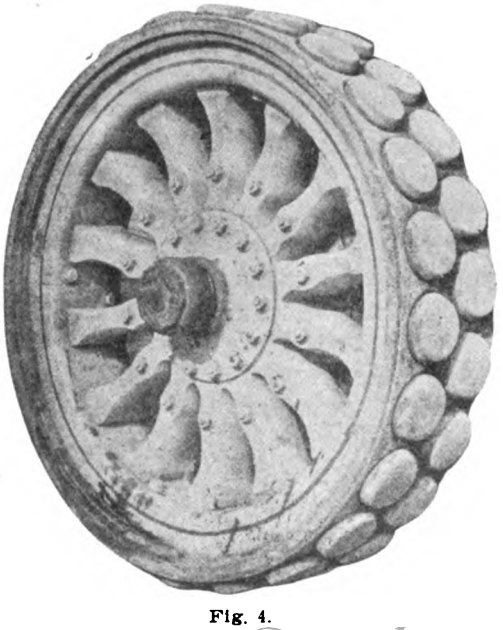

Fig. 4.

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down with the tires, but always be rigid to grip the road when the wheel skids.

* * *.

Experience has shown that devices which damage the road or tires, or which depends for their success upon the initiative of the motor wagon driver, or are noisy in their operation, are not kindly received. Chain grips, so commonly used on touring cars, are not held in esteem by heavy wagon users, although if they are not too lightly drawn across the tire they give good service on light wagons. Occasionally chains are placed between the twin sections of rear tires, being supported upon a resilient base such as compressed cork. So placed, they work to advantage, but the wear upon them is very severe.

* * *

Fig. 6 illustrates a device with plungers sharpened at the ends and hardened. These are passed through holes drilled through the felloes and rim, between the twin tires. On each plunger at a point inside the felloe is a collar, and behind this a strong spring to keep the plunger forced outwards. Being fitted with springs, the probability is that these spikes would not do any serious damage to the roads, but most probably they would get bent and jam in the holes through the felloes. However, the idea is a happy one, and is perhaps worth a trial.

Fig. 7 appears to be a second steering wheel, but is in reality a driving wheel so fixed on to the steering column casing that it cannot revolve, and yet is free to slide upwards, and so come in contact with the flat face shown on the under side of the steering wheel proper. The idea is that in the event of a skid the driver would grip the under wheel and so lock the front or steering wheels.

Fig. 8, shows the attachment of two oppositely inclined auxiliary wheels to the rear axle, kept in contact with the road surface by their weight and also by the helical spring between the two. When not in use they are fastened up to the axle. This device, however, cuts the road surface, and is very noisy.

* * *

It is the opinion of many heavy motor vehicle operators that block rubber tires side-slip even less than twins. Blocks set askew, they allege, are more satisfactory than blocks set straight to the road surface. One of the advantages of the block tire is the ease of repair. Replacement of a block may restore original efficiency.

In Figs. 9 and 10 are shown a form of construction in which the greater the side strain the more firmly do the rubber pieces of the tire adhere to the road. In the cross sectional drawing, Fig. 9, it will be observed that the rubber faces are on practically dry ground, having squeezed the mud from beneath.

The rear wheel tread of this remarkable tire is composed of 96 pieces of rubber, varying from 6 3-4 in. to 8 1-4 in. long and 1 1-2 in. broad, arranged in six rows around the wheel. Front wheels have 40 pieces of rubber only on the tread, arranged in four rows. The

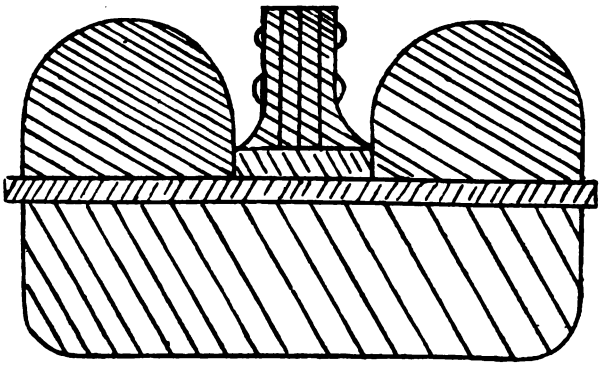

Fig. 5.

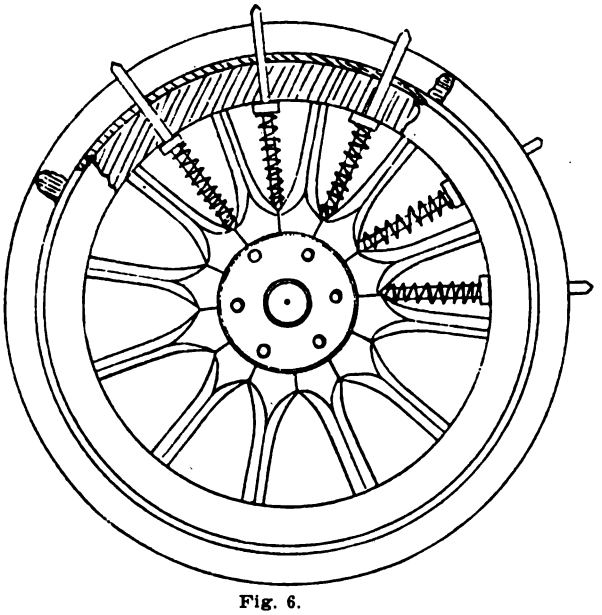

Fig. 6.

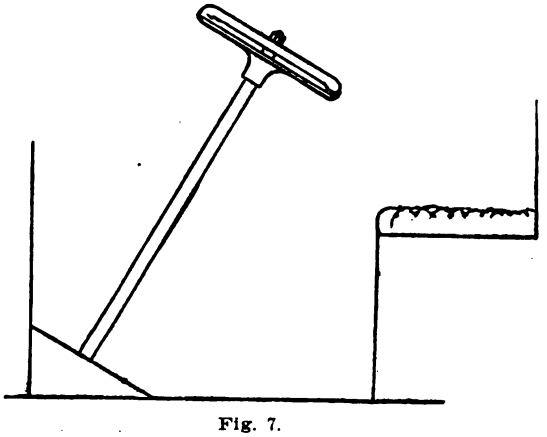

Fig. 7.

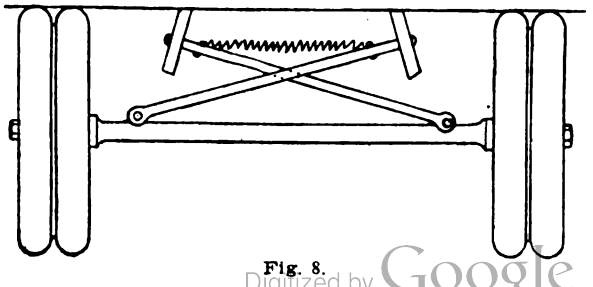

Fig. 8.

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rear wheel tread is 8 in. wide. The front wheel tread is 4 in. wide. All the blocks of rubber are wedge shaped from the tread downward at the front and rear ends—the sides being at right angles to the face and base.

Each rear wheel tread block fits into one of 96 partitions arranged in sets of six across the wheel. Each partition has a locking lug at either end which accurately fits grooves in the front and rear ends of the rubber tread blocks. The ends of the partitions are formed of brass blocks, every row of six brass blocks being fixed upon a steel bolt which passes through the side flange rings of the wheel. The inner four brass partition blocks of each row have projecting hollow cylindrical lugs which fit inside the enlarged bolt holes of the adjoining sections. In this way each row of blocks forms one complete section, of which there are 16 in a complete rear wheel.

Between each of the inner brass blocks of the cross rows is placed one of five circumferential rings of iron, the partition bolts passing through them. The inner face of each flange ring is also corrugated. The corrugated rings reach from the steel tire around the wheel felloes to within an inch of the face of the tread blocks. The flange rings are carried just 1-4 in. higher.

Thus the rubber tread blocks are each held under compression in pockets formed longitudinally by the corrugated rings and flange rings, and transversely by the brass partition blocks.

But the ingenuity of the system does not by any means end here. We have already stated that the sets of brass blocks form 16 rows across the wheel. These rows are sub-divided into four divisions in which the rubber tread blocks may be moved from one to the other as they wear. To permit this the projecting lugs of the brass partition blocks are placed higher in No. 2, than on No. 1, higher in No. 3 than in No. 2, and higher in No. 4 than in No. 3. As each partition block has two lugs, one on each side, it will be seen that the lugs are not at the same height on each side. All the lugs of each row of brass partition blocks are of the same height, however, within the corresponding ends of each row of pockets, so that the rubber tread blocks may be pushed into position from one side of the pocket to the other.

The rubber tread blocks are made in varying lengths and depths to permit of their being moved from one pocket to another as they wear down. As these tread blocks wear they are moved into the next row of pockets. The reason for the lugs on the brass retaining partitions being at different height on each side is now apparent, for when the tread blocks are changed from one pocket to another they always have an inch of free rubber above the outer rim of the corrugated rings.

It is not unreasonable to suppose that the more individual surfaces the tread of a tire is divided into the less would be the tendency to side-slip. This principle is well recognized by makers of divided tires, block sectional as well as solid twin.

In the tire illustrated the faces of the tread in contact with the ground do not spread out, and thereby

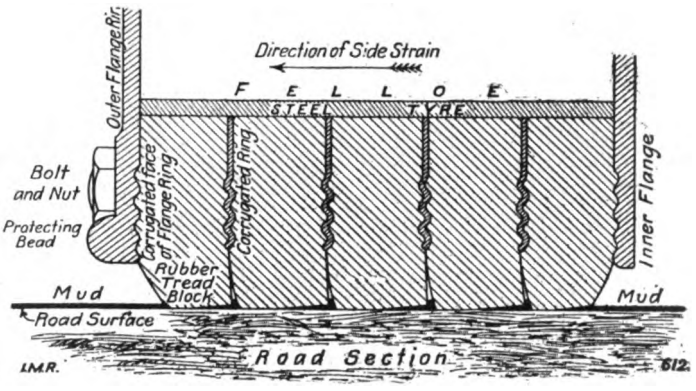

Fig. 9.

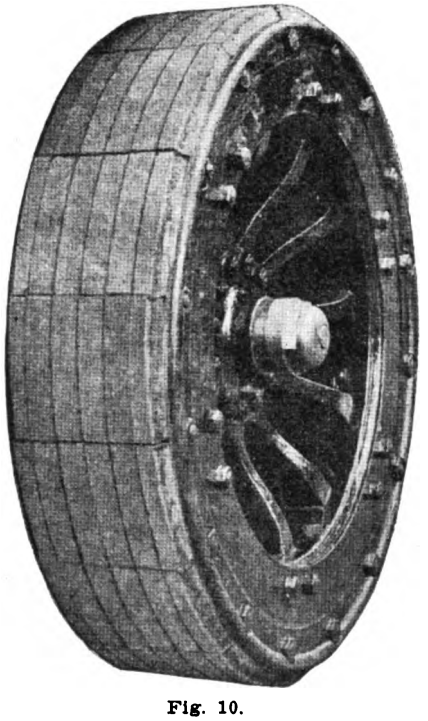

Fig. 10.

close the spaces between the rubber tread blocks. Whatever the weight on the wheels the spacings between the rubber blocks touching the road surface are preserved. Any displacement which takes place in the rubber blocks occurs from about 1-4 in. inward to the bases. That is to say, the greater the weight the more is the rubber compressed above the faces. As a result of this maintenance of interstices while in contact with the road surface each driving wheel has never less than six entirely independent contacts with the road and 12 contacts whenever a cross division comes down to the road surface while the wheel is revolving. On an average, therefore, the two driving wheels have 18 points of independent contact with the road surface.

Now when the vehicle has a tendency to side-slip, and this occurs whenever the brakes are applied, or on greasy roads, or when leaving a straight track, the tires permit only a side movement of about one inch at the commencement; and then refuse to move sideways. The greater the side strain the more firmly do the tires grip the road, and nothing less than an extraordinary circular movement of the vehicle with the front wheels as pivots will displace them.

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Interesting Show Exhibits

Parts and Equipment for Power Wagons Revealed at the First of the Big Automobile Shows

AT the December automobile show, held in New York City, a number of interesting exhibits were displayed which attracted the attention of power wagon users and makers. Omitting the completed vehicles which were described in the last issue of this paper, these exhibits were as follows:

Direct Drive Axle Co., Columbus, Ohio

This company had a highly interesting exhibit. The Pleukharp transmission axle, which was shown, represents transmission in the axle, thereby avoiding all other forms of change speed mechanism. Its high efficiency is due to the direct drive on all speeds forward and reverse. There is no clashing on a change at any speed as all gears are constantly in mesh. On the high gear all other gears are idle. The reverse can be set while going forward by first loosening the master clutch, and it can then be used as a brake for an emergency stop. All parts of the axle transmission are positively driven and there is an entire absence of all frictional devices. It is not necessary to loosen the master clutch on a change from high into low, as this can be done instantly at any speed without noise or jar.

Torbenson Motor Car Co., Bloomfield, N. J.

This firm exhibited a chassis for a one-ton delivery wagon, fitted with an 18 hp. two-cylinder horizontal opposed engine. Planetary transmission is employed. The construction of the rear axle is unique. It is a solid square dead axle, carrying a jack shaft, by means of which the power is transmitted to the hubs of the wheels through spur gears, which are enclosed in a dust-proof casing and work in oil.

Worth Motor Car Mfg. Co., Evansville, Ind.

This firm exhibited a 16 passenger motor bus, operated by a 40 hp. gasoline engine. It is designed for fast and heavy work. Unusually long springs are provided. This machine is well adapted for stage route, hotel, sight seeing, park touring and railway terminal service.

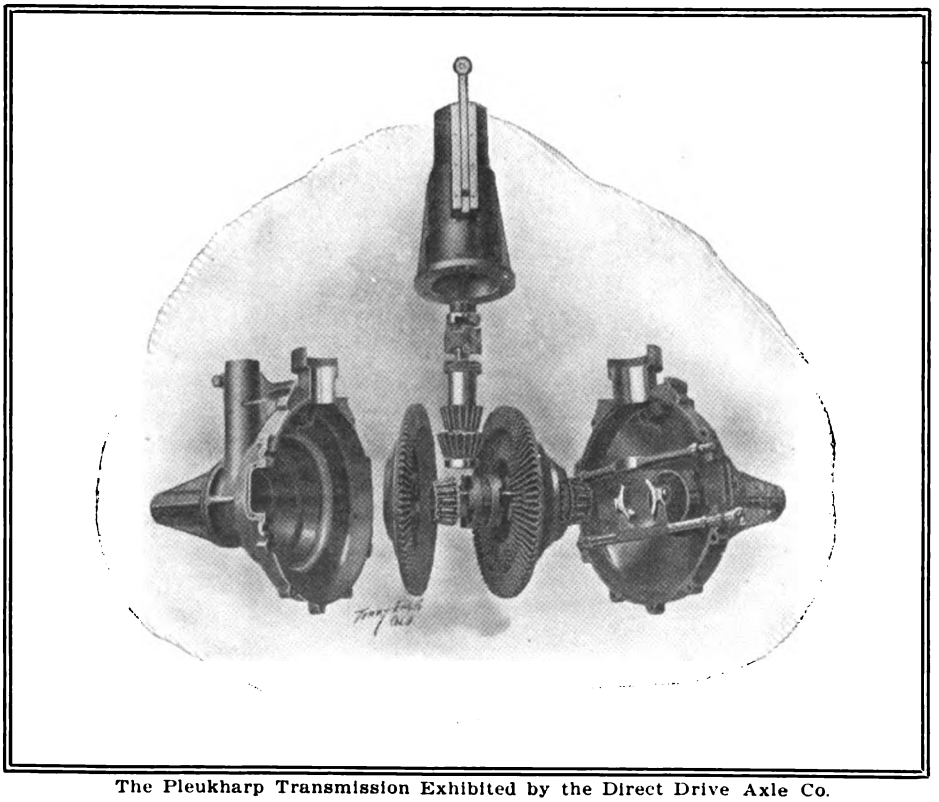
Lansden Company, Newark, N. J.

The electric wagons which this firm exhibited are built in sizes suitable for light loads and fast speeds all the way up to 3-ton trucks at moderate speeds. The armored frame receives the entire weight of the power equipment and is carried on four *long, semi-elliptic springs* securely clipped to *solid axles*. The *wheel treads* are either 56 or 66 inches, and the *wheel bases* range from 76 to 111 inches, according to the standard chassis selected. The *single motor* is swung on the frame in any position suited, and is not subjected to the severe strains and shocks occasioned by rough roadways. The motors and controllers are built especially for this service. They embody all the latest improvements that have been developed in the art of automobile application. The controller gives three or four speeds forward and two reverse, without interruption of the current, permitting a perfect control of the wagon under all conditions. The drive is by chains and sprockets, giving an efficient and flexible transmission which adapts itself to the changes of alignment on account of the unevenness of roads. There are three chains —one from the motor to the cross differential countershaft and two chains from the ends of the countershaft to the rear driving wheels. The rear axle does not revolve, it being a part of the wagon and not a part of the transmission arrangement. The brakes are the internal expanding form, unusually wide, and act direct on the drums of the rear wheels. A standard concentric charging receptacle is located conveniently on the chassis and a safety switch for cutting off the power is within easy reach of the operator. The battery compartment is underslung and arranged to receive the various sizes and makes of batteries that are specified.

General Electric Co., Schenectady, N. Y.

Mercury arc rectifiers for charging ignition storage batteries, as well as charging panels for electric automobiles, were shown by this firm.

Realizing that direct current is seldom available for charging storage batteries the company has developed a small mercury arc rectifier for this purpose. By means of this outfit an ignition battery may be readily charged from an ordinary 110 volt alternating current circuit. Mercury arc rectifiers convert the alternating current into direct current by means of a tube containing mercury vapor which acts as an electric check valve, allowing current to flow in but one direction. By taking current alternately from the two sides, a commutation is effected which gives a direct current at a reasonable efficiency. The self-contained outfit consists of four essential elements: the slate panel with switches, etc., a compensating reactance, a regulating resistance and the rectifier tube. The charging panel for electric automobiles requires a floor space of only 16x18 in. with a height of 76 in. On the front of the panel is mounted a direct current ammeter and voltmeter, a double pole switch for connecting to the alternating current supply, a direct current circuit breaker on the load side, and a double throw, spring starting switch. The tube is mounted on the rear of the panel and its holder is provided with a hand wheel on the front to facilitate its agitation at starting. A compensating reactance and regulating reactance with regulating switch furnish means for extremely fine adjustment of the voltage without interrupting the arc. The maximum capacity of the vehicle charging panels is 40 amp., but as it is practical to operate them in



The Pleukharp Transmission Exhibited by the Direct Drive Axle Co.

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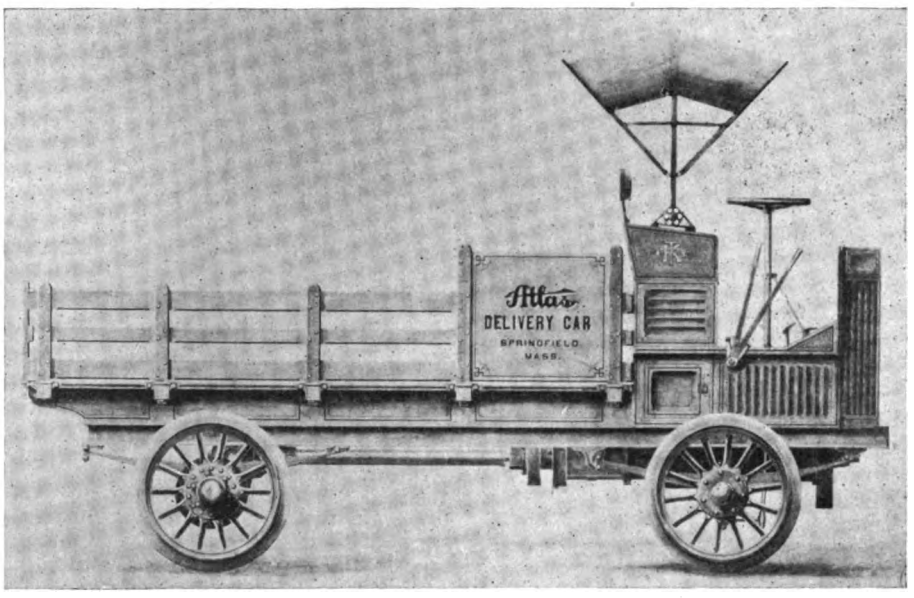
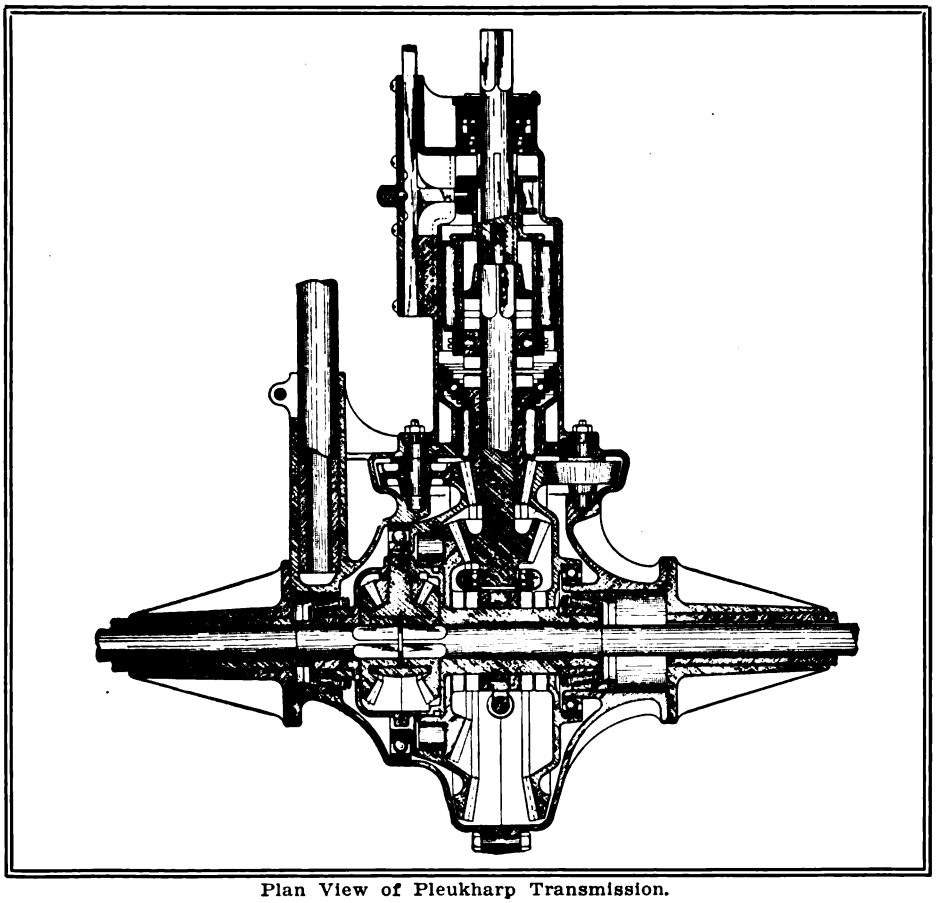
multiple any desired current may be obtained. A multiple panel on which several tubes are mounted has been designed by the General Electric Company, and is recommended where heavy duty has to be performed. Any tube in this type of panel may be operated separately where a large capacity is not required.

Knox Motor Truck Co., Springfield, Mass.

This firm exhibited a new 1½-ton model for delivery work as well as its 3-ton truck. The new model is fitted with a 30 hp., two cylinder engine, of the two-cycle variety, water-cooled, 6-inch bore and 5-inch stroke. The rated power is obtained at 1,000 r. p. m. The selective type of sliding gear transmission is used. The drive is by shaft from the engine, with bevel gear connection to rear axle and with one universal joint. Changes in gear ratio can be quickly made; to facilitate this the differential housing is split angularly, and with the upper portion off the changes of ratio can be made. The driving shaft is never out of alignment over 2 degrees with the engine shaft; this eliminates wear to the universal joint. All rotating and moving parts of engine, transmission and drive are completely encased and run in oil. The power is transmitted through an eleven-disc clutch, having both sets of discs of soft steel and eleven inches in diameter. The carburetter is of special design for double acting engines, having few parts and being very reliable. The front axle is of I-beam pattern, drop forged, with forged steering knuckles. The rear axle is tubular, heavily trussed, with floating driving axles inside and clutching the driving wheels at the outer end of the hubs. The main brake is double acting band type operating on drum on rear end of transmission shaft; emergency brakes are double acting and operate on the inside of large drums attached to the driving wheels. The wheel base is 8½ feet; the tread is 56 inches. Four inch tires are fitted to rear wheels and 3½ inch tires to front wheels. The speed with load may be varied from 10 to 16 miles. The fuel consumption is one gallon for every ten miles. The fuel tank capacity is 25 gallons. The weight of the vehicle is 3,500 pounds.



Atlas 1½-Ton Gasoline Wagon.



Plan View of Pleukharp Transmission.

Light Mfg. & Foundry Co., Pottstown, Pa.

Aluminum, manganese and phosphor bronze castings were exhibited by this firm. Of aluminum castings the company says: "There are no castings which are too intricate to be made in aluminum, if patterns are properly made. We will assist any manufacturer by giving him the benefit of our experience in advising him of any changes which would make his patterns conform with the requirements of first-class aluminum castings. We know that a great many manufacturers are skeptical, but we can prove to any one that aluminum is the proper metal for castings for most all parts of the automobile." Manganese and phosphor bronze castings for pinions, gear wheels, piston rods, levers, and other parts in which high tensile strength is required, were exhibited. Only automobile castings are made in the foundry of this company.

Whitney Mfg. Co., Hartford

Whitney driving chains, made in Hartford, Conn., were shown for light and heavy vehicles. The "repair link" of these chains is furnished with one side plate having notches in the top surface. This designation is distinctly useful. The notched plate may be removed by hand after the cotter pins have been taken out.

Diamond Chain Co., Indianapolis

This firm exhibited, in addition to its regular models, a chain having side links of chrome nickel steel, very light in weight, but exceedingly strong. It is made in three sizes, ¾, 1 and 1¼-inch, with ½ to 1½-inch pitch.

American Ball Bearing Co., Cleveland

This company exhibited front and rear axles, some of which are being extensively employed by makers of light motor delivery wagons.

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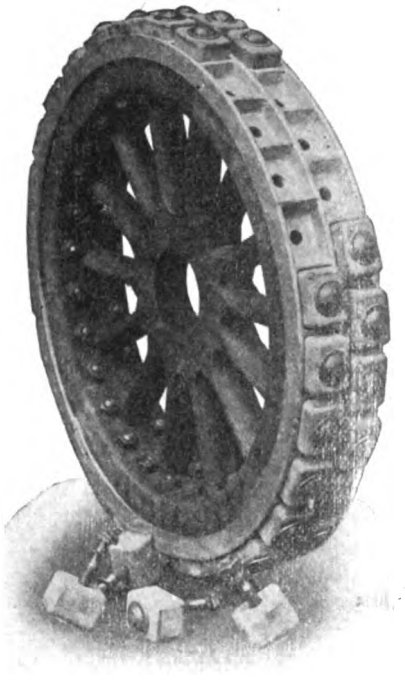
Arthur H. Middleton, Philadelphia

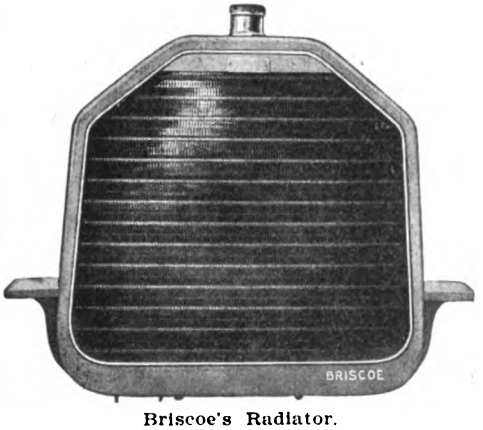
This gentlemen exhibited a highly interesting tire for heavy motor vehicles. It is not inaptly described as "wearing like iron and riding like rubber." It is made of rubber sections, which are bolted into recesses in a cast steel channel. The sections are held in place by bolts, which permit of sufficient movement to give the rubber freedom of action under compression; thus the tire derives the full benefit of the resiliency of the rubber. The bolt heads and washers protect the rubber sections, so that the wear comes on the metal instead of the rubber. A truck, weighing 9,800 pounds, fitted with 9x36 in. tires of this kind, has been in operation for a year and a half, and the only repairs required were the renewal of bolts, which represent a very small expense. The tires are still in good condition. Stock sizes include tires and channels complete and are 36 inches in diameter, with either 5, 6, 8, or 9 inches width, with two or three rows of sections. Other sizes made to order.



Middleton's Rubber Section Tire for Heavy Vehicles.

Briscoe Mfg. Co., Detroit

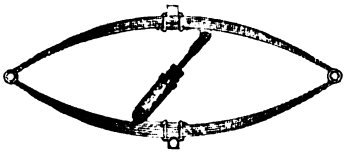
Radiators in eight patterns, fans, fins, tubing, hoods, fenders, and tanks were exhibited by this firm. A radiator made with flat tubing was shown for the first time. The flat tube has been thoroughly tried by some of the leading automobile manufacturers, both here and in Europe, during the past year, and has proven to be very efficient. The advantage of the flat tube over the round tube is due to the comparatively greater amount of surface for any given volume of water, a circle having the least circumference of any possible figure of the same area. Flattening the circle thereby increases the comparative amount of circumference or air exposure.



Briscoe's Radiator.

Midgley Mfg. Co., Columbus, O.

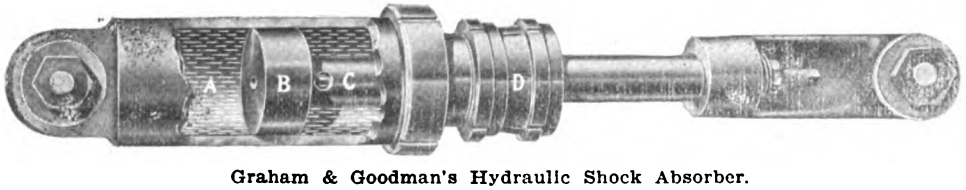
In a test of the Midgley tubular steel wheel, which is made wholly of steel, conducted at the Ohio State University, with a load of 10,000 lbs. applied at the hub, there were no visible signs of the wheel giving down, and the maximum load was 19,500 lbs. This test was made on a medium weight wheel. For the driving torsion test a heavy wheel was fitted with a shaft 1⅝ in. in diameter. The shaft was twisted a quarter revolution without doing any damage to the wheel. The argument for the Midgley wheel is thus presented by its makers: "The wheel must transmit the whole power of the motor, which is usually applied to it at the hub. This work it must do in addition to carrying the weight of the machine and taking the sidewise thrusting strains whenever it departs from a straight line. It must do all that an ordinary carriage wheel does, as well as all that the motor may call upon it to do; and no wheel is better adapted to take this torque or hub strain than one that is made all in one piece." The spokes of the Midgley wheel are reinforced where the greatest strength is needed, and left light where the strain is less. The several parts of the wheel are brazed together by a process of brazing that is in itself the highest development of that art. The entire wheel is immersed in a molten bath of brass which flows into every remote corner and covers every surface with a layer of the metal. This metallic joining makes the wheel one single piece. There is not a separate bolt, rivet, nut, washer or pin in it.



Hydraulic Shock Absorber Applied to Elliptic Springs.

Graham & Goodman, N. Y. City

The hydraulic double-acting shock absorber shown by this company is based on this principle: a fluid of certain specific gravity can pass through an opening of certain size, up to only a certain speed. *When that rate of speed is reached, no amount of pressure can increase it.* The illustration shows a sectional view of the absorber. "A" is the cylindrical chamber on either side of "B," holding the oil. This chamber is closed at both ends, save for opening in the upper end through which the piston-rod "C" works. There is a small valve-hole through center of the piston-head, "B," and coming out at one side of the piston-rod, "C," which valve-hole permits passage of the oil through the piston-head and rod. As the piston-head and rod, or plunger, "B-C," works back and forth in the chamber, the oil is forced through the valve-hole first in one direction, then in the opposite. As the oil can pass through the valve-hole up to only a certain speed, the plunger can be worked in and out up to only a certain speed. You can hit the end of the plunger a sharp blow with a heavy mallet, but you cannot force the plunger in faster than that speed. On the other hand, you can push the plunger in slowly with one finger. In drawing out the plunger the effect is the same. Whatever strength of shock is received by the plunger, in either direction, a distinct oil cushion is formed between the piston-head and one or other end of the oil chamber. The resistance is automatically regulated. As the piston-head always rests in the middle of the chamber when the absorber is not in action, the device may be attached to the springs with either a forward or backward angle and thus permit the springs to exercise their intended re-



Graham & Goodman's Hydraulic Shock Absorber.

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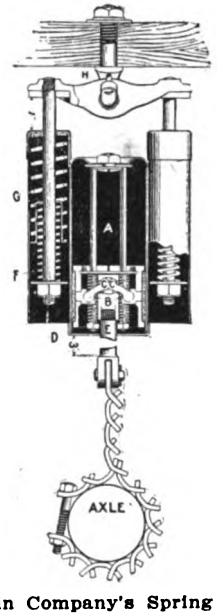
siliency before the shock absorber retards their movement.

Kinsey Mfg. Co., Dayton, O.

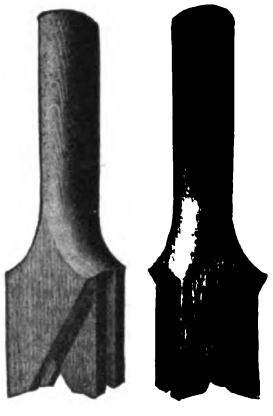
Pressed steel frames, radiators, radiator fans, hoods, steel dashes, mechanical oilers, gasoline and water tanks, gasoline gauges, mufflers, fenders, dust and drip pans, and other automobile parts were exhibited by this company.

Baldwin Chain & Mfg. Co., Worcester

In addition to its driving chains this firm showed its improved spring recoil check, an automatic frictional device for controlling the recoil of the vehicle's springs. It permits free action of the springs over smooth roads, but steadies the movement of the vehicle over rough places and to a large degree relieves the weight from the tires when striking severe obstructions in the road. Oscillations do not strain or break its parts and no oiling or adjusting is required. The active principle of the device rests upon the theory that a check must not impede free spring action, not merely when smooth roads make such action slight, but when roads are rough and springs are called upon to exercise their fullest functions. The illustration shows that inside the brass cylinder (A) is a divided piston covered with compressed cork which contracts with the sides of the cylinder. A set of toggle arms (C C) butt against each side of the piston segments. A yoke (B) over the top, drawing them down, is attached to the axle through the piston rod by a chain. Spring cases (D) are secured to each side of the cylinder. They contain compound springs. These springs, through a yoke (H) and bolt hook, are attached to the body of the vehicle, so that the combination between the body and the axle is a graduated frictional resistance to the recoil of the springs. This allows free action of the vehicle springs in both directions under ordinary road conditions. That is to say, the compound springs are in continual action while the piston is motionless. When the area of action is increased the piston is instantly brought into action and controls the upward rebound. When the action is extreme the compound springs bottom, and the action between the body and the axle is then entirely through the piston movement until the recoil is checked, when the springs are again brought into action. It is apparent from the foregoing description that the check is radically different from anything now on the market. It is unique. The compound springs can be graded to different tensions of springs according to need. They can be easily changed. The chain for conection with the axle is designed especially for the purpose and consists of independent units which can be locked together forming any desirable length and which will clamp around any form of axle. The device, after it is attached, needs no oiling or adjusting.



Baldwin Company's Spring Recoil Checking Device.



Spoke Tenons of Schwarz Wheel.

Schwartz Wheel Co. Philadelphia

This firm exhibited artillery wheels for light and heavy vehicles. The characteristic of the Schwarz wheel is the interlocking of its spoke tenons, a form of construction which even under the most severe conditions insures constant and positive spoke support. No hub flanges are required in making the wheel; they are practically unnecessary until the wheel is to be put on the axle. The distances between the spokes are mathematically alike.

Whitlock Coil Pipe Co., Hartford

This firm exhibited radiators of the honeycomb, cellular and tube and disc types, as well as a special type for motor wagons and heavy trucks.

Swinehart Tire & Rubber Co., Akron

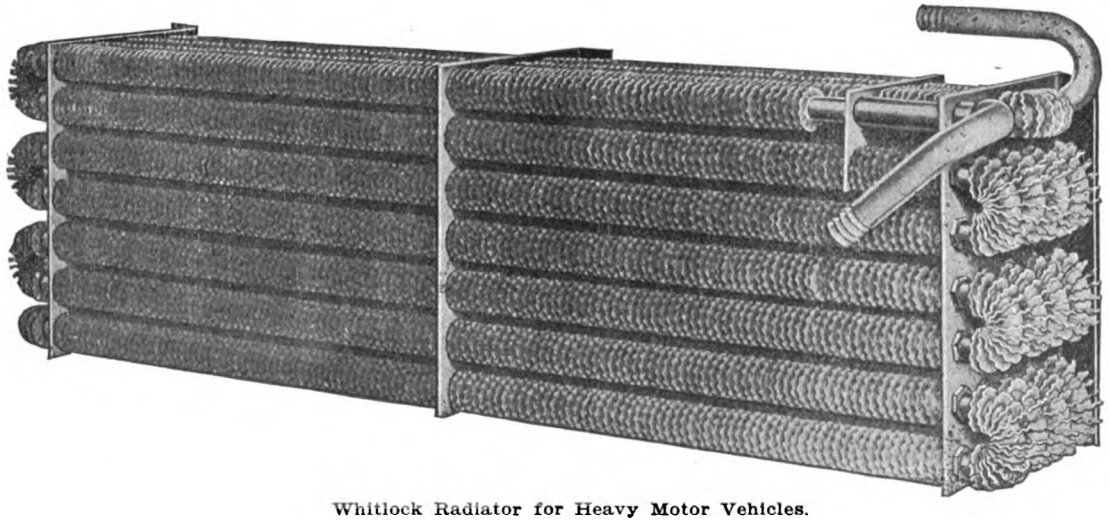
Solid tires, twin and single, for motor wagons were exhibited by this firm. A testing lever was employed to show the superior resilience of the rubber compound in these tires.

Brown Lipe Gear Co., Syracuse

This company exhibited equalizing and steering gears. The factory is supplied with the most modern machinery for producing bevel, spur and spiral gears, and for the rapid and accurate duplication of parts.

Hartford Rubber Works, Hartford, Conn.

This firm showed a new solid tire, with spiral wire base, for motor wagons. It can also be supplied with wire anti-skid tread.



Whitlock Radiator for Heavy Motor Vehicles.

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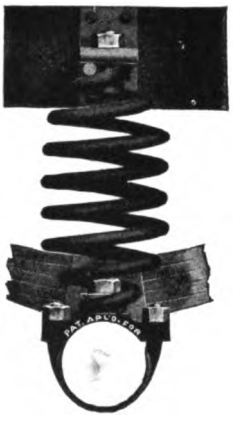
J. H. Sager Co., Rochester, N. Y.

The auxiliary equalizing and flexible springs shown by this firm practically exercise opposite functions, the former being applied to govern the vertical action of elliptic and semi-elliptic springs under moderate or severe loads, while the latter, used in connection with springs somewhat stiff, carry the initial weight and are brought into action before the flat springs are affected. The value of the auxiliary flexible springs is very apparent in a vehicle which, like the power wagon, is as a rule very poorly provided with means for cushioning very light loads. They are held firmly in a vertical position.



Sager Equalizing Spring.

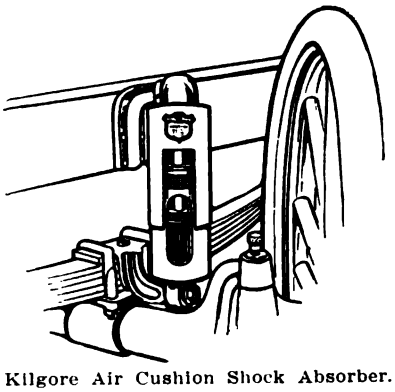
Kilgore Auto Air Cushion Co., Boston

The shock eliminating device exhibited by this company allows free use to flexible springs. Four grooves are cut lengthwise of the cylinder in the inner walls, at equal distances apart. These grooves, of equal length, begin and end at different distances from the top and bottom of the cylinder. This allows the air sufficient passageway through all four grooves, so that it is not impeded with the action of the springs on good roads. But when the springs have a tendency to go too far down, these air passages are reduced in capacity by the passing of the piston beyond the ends of one or more of them. This checks the flow of air gradually and, acting on the spring, prevents it going down too fast. When the last groove is passed the motion of the spring is stopped on the elastic dead air cushion in the bottom of the cylinder. The recoil is taken care of in exactly the same way as was the downward motion.

Sager Flexible Spring.

Diezeman Shock Absorber Co., Hoboken, N. J.

The shock absorber shown by this company acts both on the downward and upward motion of the springs. It is simple in construction, compact, durable, dirt-proof and self-lubricating. The bronze casing contains fiber friction disks and a steel friction spindle. This casing is bolted to the side member of the chassis. The friction disks are packed in grease, and by means of a screw plug may be adjusted to yield the desired resistance—thus the amount of friction necessary to effect the desired retardation is obtained. The adjusting plug is held in position by set screw. A lever is connected at one end of a connecting link which is pivotally secured to a plate mounted upon the vehicle axle or spring. The joint consists of a tapering stud which works in a fiber bushing. The construction of the device is such that it can readily be attached inside or outside of the chassis or frame, and when once properly adjusted requires no further adjustment or regulation.



Kilgore Air Cushion Shock Absorber.

Model Gas Engine Works, Peru, Ind.

Gasoline engines and planetary transmission gears were exhibited by this firm. Four-cylinder engines varying from 25 to 60 hp. are made, the special features of which are: valves mechanically operated; exhaust valve in end of cylinder; large valves; large crank shaft bearings; each cylinder separate; one cam shaft operates all valves, and so arranged that by removing 4 nuts the entire cam shaft can be withdrawn without disturbing the balance of the machinery; cylinder heads cast integral; complete absence of packing joints.

Diezman Shock Absorber.

Thomas Prosser & Son, N. Y. City

Krupp chrome nickel steel for gears, crank-shafts, axles, cam-shafts, steering knuckles, frame members, etc., was exhibited by this firm, as well as other special grades of Krupp steel for automobile use. The chrome nickel steel can be used unhardened, having a minimum elastic limit of 95,000 lbs. per square inch, minimum tensile strength of 110,000 lbs. per square inch, elongation of 16 per cent. and contraction of 67 per cent. This steel can be case hardened, or can be hardened in oil so the elastic limit and tensile strength will be more than double the above figures.

Detroit Lubricator Co., Detroit

This firm exhibited force feed oil pump without actuating springs or check valves. The pump is so constructed as to pump against any reasonable pressure in order to keep the piping free from obstructions. As little pressure as possible is maintained on the sight feed glass and the packing, to avoid possible breakage and the leakage which usually results from the use of a packed glass in connection with oil under pressure. The sight feed feature is not in the line of the piping between the pump and the point to be lubricated. The quantity of oil to the sight feed accurately represents the amount of oil that goes to the bearing, and this result is obtained by pumping solid oil and keeping air out of the pump cylinders and passages.

Byrne, Kingston & Co., Kokomo, Ind.

This firm exhibited automatic compensating carburetters, mufflers, timers, circulating pumps, spark coils, switches and plugs.

Brownell-Trebert Co., Rochester

Gasoline engines, disc clutches and transmission gears were exhibited by this firm. The engines are of the four-cycle, vertical water-cooled type. One type of engine has cams, cam shaft and rocker arms located over the head of the cylinders. The other has cams, cam shafts and rocker arms placed in crank case of motor, and nothing visible overhead of cylinders except the valve lifting arms.

The overhead type is built in two forms, one with four cylinders and water jacket cast integral, the other with twin cylinders integral with water jacket. Both forms of this type have cylinders separated, and ample supply of water completely surrounding each cylinder. The plain top type is made in one form, with cylinders cast in pairs, with one intake and one exhaust port for each pair of cylinders.

Great attention has been paid to the de-

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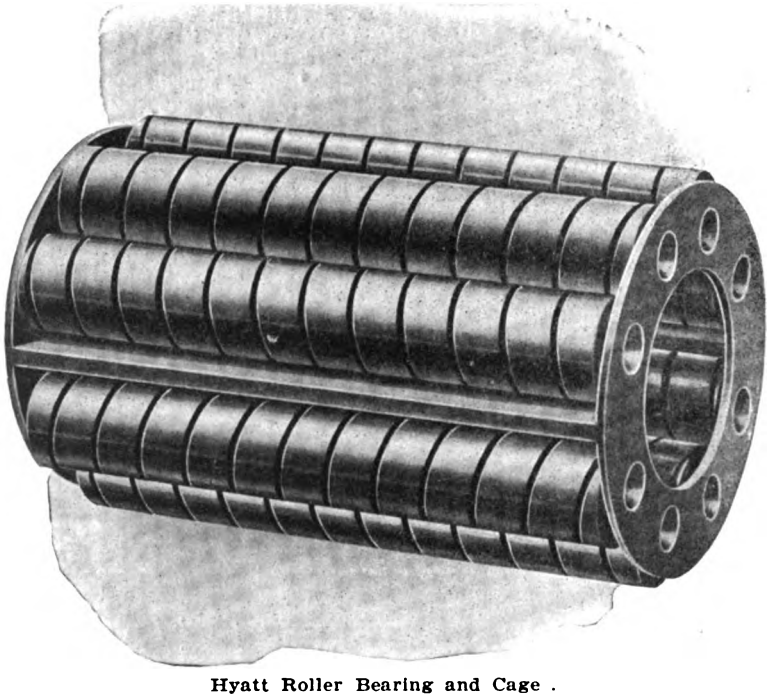
tails of proportioning all parts of these motors, using the best materials for the purpose in all parts subject to great stress and strain, and in all bearings and wearing parts. The disc clutch is composed of alternate discs of phosphor bronze and crucible steel, all contained within the fly-wheel of motor. The bronze discs are connected to and driven by the fly-wheel, the steel discs being connected to the transmission shaft. These discs are continually immersed in oil in an oil tight case; the oil acts as a cushion between the discs and allows a gradual setting of clutch without jar or shock until the oil is forced from between the discs, when perfect adhesion occurs and results in a perfectly smooth working, powerful and durable clutch. The transmissions are of the slip gear variety and have strength for 45 hp. motors. The gears are of large diameter. The teeth are rounded on the edge of reverse side only, making it easy to slip for changes of speed.

Hyatt Roller Bearing Co., Newark, N. J.

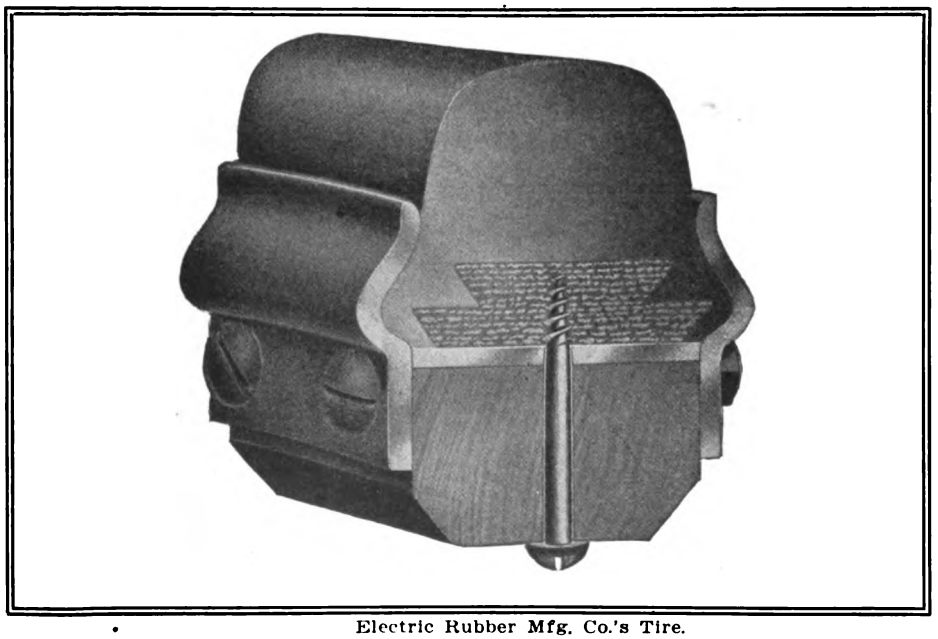
The flexible roller bearing exhibited by this firm is so designed that its crushing strength is suitably proportioned to the load under which it is to operate, allowing a liberal factor of safety. The rollers are not in contact when under load, the surfaces of adjacent rollers revolving in opposite directions. The roller surfaces are not hardened. This, with the flexibility of the roller, enables it to present contact along its entire length. The roller is made from a strip of steel wound into a coil or spring of uniform diameter. The greatest advantage of a roller of this construction lies in its flexibility, enabling it to present at all times a bearing along its entire length, resulting in a uniform distribution of load on the roller itself, as well as the surfaces on which and in which it operates. All tendency, therefore, to distortion of these surfaces is eliminated, for the roller will adjust itself to all irregularities that may be present.



Hyatt Roller Bearing and Cage .

Electric Rubber Mfg. Co., Rutherford, N. J.

This firm exhibited a solid endless rubber tire made especially for heavy motor vehicles. This tire is attached to the felloe is by slightly stretching the same, say one-eighth inch, and slipping over felloe band, then passing a lag screw through the felloe from the under side, and screwing into the core which is a part of the tire. This gives steel side flanges, rolled in conformity with the shape of the tire, and attached to each side of the felloe by bolts passing through the felloe and the two flanges. In cases where pieces of the tire have been torn out, a section can be cut out and a new section inserted, making the tire as good as new.



Electric Rubber Mfg. Co.'s Tire.

Warner Gear Co., Muncie, Ind.

This firm exhibited differential, steering and transmission gears. In the differential gears the hubs of the two axle spur gears are mounted in long bearings, which prevents the spur gears from getting out of alignment and binding the pinions. Web bearings positively prevent end thrust through the case from either side. All spur and bevel gears are hardened. The large bevel gears and pinions are hardened, straightened and ground to micrometer sizes, thereby reducing noise to a minimum. The main driving shaft of the transmission gear, which is of the selective type, is squared and carries the two shifting gears, which are shifted by two yokes, sliding on two round stationary rods, engaging two forged fingers mounted on rod and sleeve connection, leading to the selective lever. This telescoping connection is furnished any length desired. Selective transmission gear and emergency brake levers were also exhibited.

Am. & British Mfg., Co., Bridgeport, Conn.

Pressed steel frames—pressed either from cold or hot rolled stock—forgings and miscellaneous parts were exhibited by this firm, which is preparing to make all parts of an automobile, including the engine. Its plant is well equipped for automobile work, and on account of the large number of orders from both the army and navy for ordnance material, where the greatest accuracy is required in manufacture, the workmen have become trained in doing work of the highest quality and, therefore, it is no hardship to undertake work tolerances of which are in the thousandths.

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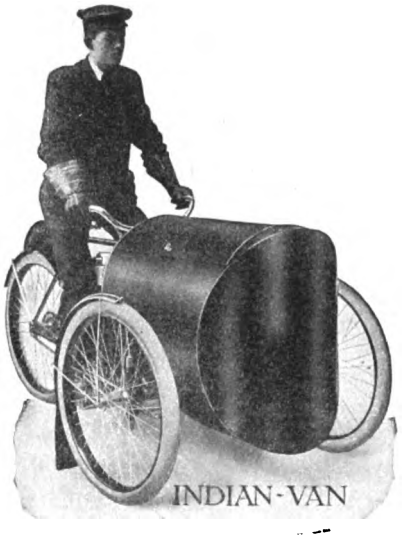
Webb Mfg. Co., Newark N. J.

A speed and distance recording instrument was exhibited by this firm. The principle underlying its operation is that used in holding a feather in the air with your breath. The index, weighing five grains, or less than the feather's weight, is lifted by an air current passing round it in a taper tube. The index rises in exact proportion to the amount of air that flows. Mr Edison has designated it an ampere meter for air. A little pump, most accurate and simple, creates an air current whose volume or velocity varies in exact proportion to the speed of the vehicle. There is no friction whatever to prevent free motion of the index. The instrument is driven by a flexible shaft attached to the knuckle of the front wheel.

Webb Recording Instrument.

Hartford Auto Parts Co., Hartford, Conn.

This firm exhibited the "Hartford" universal joint and shaft drive sets through their agents, the J. S. Bretz Co., of New York City. The joint is manufactured in two types and four capacities for drives up to 80 hp. Its distinctive feature lies in the spherical form at the end of the driving arms of the hubs, these spherical or ball shaped ends fitting into sockets in an annular ring which serves to transmit power by a direct compression load from the driving to the driven elements. The construction gives relatively little movement of the frictional surface for a given angle of action, and eliminates any possibility of increased friction due to parts springing and cramping under load.



Hendee Motor Parcel Carrier.

Hendee Mfg. Co., Springfield, Mass.

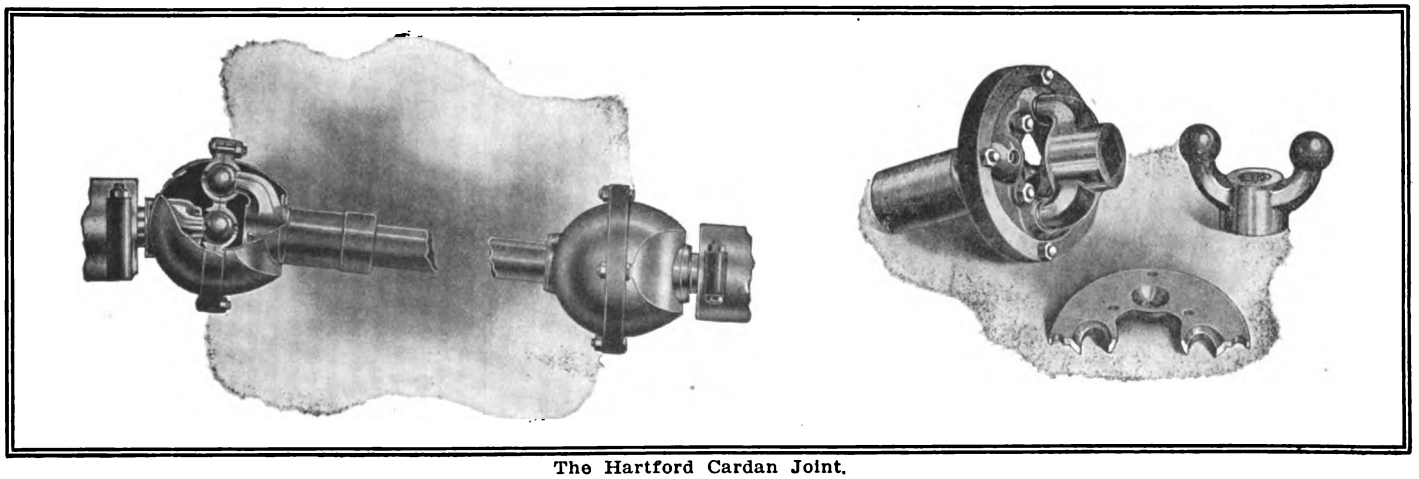
This firm exhibited a motor tricycle with package carrying attachment. The wheel base is 51 inches. The motor develops 2¼ hp. at 800 revolutions per minute. The machine weighs 115 pounds. It is chain driven.

Vestal Shock Absorber Co., Pittsburg

The friction band shock absorber exhibited by this company consists of a drum attached to the side member of the frame. On the outside of and encircling the drum is a split ring or friction arm. Between the face of the drum and the face or inside of the friction arm is a friction lining of leather or other suitable material. Tension on the friction surfaces is maintained by means of a bolt which holds the ends of the friction arm together. The friction arm is connected to the spring clip by a link, in which are placed two balancing springs. This allows a movement of two inches between the spring and frame before the friction sets in to check the compression or re-bound. This overcomes the "deadening" of the springs under light load or when passing over small obstacles. When surmounting an obstacle, the action of the spring is as follows: the spring of the vehicle starts upward and, instead of acting on the friction immediately, compresses the lower balance spring upward against the collar of the plunger. When this spring has been compressed its full limit the bottom of the plunger strikes a cushion at the bottom, and the friction begins to check the upward movement. When the spring starts on the rebound, the upper balance spring is compressed downward against the top of the collar until it is fully compressed; then the friction sets in. On smooth roads the friction is held as a reserve checking force, being used only when the movement between the axle and frame goes beyond the pre-determined point.

Oliver Instrument Co., Minneapolis

The speed and distance registering instrument exhibited by this company occupies no more than four inches of space. The flexible shaft for operating the instrument is a novelty. It is made of solid tool steel, cut and arranged into a continuous series of universal joints, which give the shaft more flexibility and strength. The instrument is of the mechanical, centrifugal type. A vertical spindle carries a brass ring or weight which normally lies in an inclined position close to the shaft, but under the influence of speed tends to assume a position at right angles to the shaft. The motion of the weight is restricted by a spring which bears on a cam surface attached to the weight. At rest the spring bears on a cam near the center of oscillation, but as the speed increases and the weight tends to move toward a horizontal position, the cam rocks on the spring, throwing the point of contact away from the center of oscillation, thus always proportioning the strength of the spring to the force of the weight. The effect of this construction is twofold. First, it causes the weight to swing through equal angles for equal additions of speed, and allows the dial to have equal graduations throughout the range of the instrument without a complicated mechanism between the weight and the indicating hand. Second, at any speed the weight has an equal power for moving the indicating mechanism, and



The Hartford Cardan Joint.

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friction will have less effect on the accuracy of the instrument.

The spindle is mounted on ball bearings and the pivots of the weight are also ball bearings, so that in every possible place the friction effect is reduced to a minimum.

Auto Improvement Co., N. Y. City

This firm exhibited an instrument which combines the functions of a clock, a speed recorder, a trip mileage recorder and an annual mileage recorder. The mechanism and governor, working on the principle of centrifugal force, are theorectically and practically correct. A flexibile shaft of improved design, to prevent breakage, actuates the mechanism.

C. T. Ham Mfg. Co., Rochester

The oil lamps shown by this company are remarkable for light producing and other qualities. They give off no smoke or odor and hence no soot accumulates; the front glasses do not "sweat" and have a greasy appearance. The simple and effective locking device for attaching oil fount to body of lamp makes the burner easy of access for trimming the wick or filling the fount. The brilliant white flame of these lamps is ascribed to the application of the "cold blast" principle.

Heinze Electric Co., Lowell, Mass.

Coils, timers and high potential distributers were exhibited by this firm. Speaking of the subject of motor vehicle coils the company says: "Extensive experiments have demonstrated to us that at the highest point of compression in the cylinder a great number of sparks should be produced by the coil instantly in order to insure complete ignition by the intense heat which would be produced by a great many sparks in rapid succession, the object being to give the piston no possible chance whatever to move forward and thereby letting down the compression. In order to produce such a hot spark of great frequency we found it necessary to have the vibrating arm at all times make a firm contact. At the same time the vibrating arm should be very light or of a very small mass, and its fulcrum of vibration should be very short in order to produce speed in the vibrating arm. In order to produce a coil which should give a great many vibrations per second it was necessary to intensify the magnetic field. This we have accomplished by means of our radiating magnetic arms which produce about five times as much magnetism as is generally produced by the magnetic core alone. By this addition we attach our vibrating arm or armature to a very stiff spring, enabling it to vibrate at high speed."

Shelby Steel Tube Co., Pittsburgh

This firm exhibited seamless tubing as a substitute for solid stock in many forms of automobile construction, such for example, as axles, engine cylinders, cooling pipes, bearings, braces, bushings, collars, exhaust pipes, steering shafts, hollow axles, vaporizer tubes, levers, piston rods, roller bearings, sleeves, sockets, etc. Owing to its smooth finish and slight variation in diameter and gauge, a cold drawn steel tube can often be used to advantage and with economy in place of an article ordinarily machined from solid stock.

The Autocoil Co., Jersey City, N. J.

This firm exhibited ammeter coils, coils without ammeter, coils for dual ignition, distributor coils of unit construction, wood box coils of compound vibrator and bow spring trembler type, and non-vibrator coils. Storage batteries are not required with its ammeter coil. The ammeter is a full sized station type, dead beat in its action, and accurately indicates the current used. It is the first ammeter applied to an automobile coil that can be kept in continuous service without being affected by stray magnetism from the different energized coils in the containing case. Coils without the ammeter will be found, by testing, to consume anywhere from 3-4 to 2 amperes, making it next to impossible to get synchronous firing, causing an extraordinary demand upon the battery, an unnecessary eating away of the trembler contacts and burning and pitting of the timer segments.

R. E. Deitz Co., N. Y. City

The oil lamps exhibited by this company embody in their construction the well known cold blast tubular principle. The sides, being double, form an air chamber. The cold air, being admitted into said chamber at the top, decends to the burner, and the hot air and products of combustion escape through the central passage. Wind does not affect the light. Reflectors are removable. The lamps do not smoke, or jar out.

Muncie Auto. Parts Co., Muncie Ind.

This firm exhibited both selective and progressive types of transmission, control levers, steering wheels, cone clutches and universal joints. The transmission gears are of 6 pitch, hand finished all over and perfectly hardened. The axle for the sliding gear, hollowed to receive about 7¼ inches of the primary axle, has two long bearings to afford perfect alignment. The hollow axle has four keys milled out of solid steel, and a round part on the bearing of the sliding gears, so that the latter make a perfect fit on the axle. This prevents the two sliding gears from slipping four times as the axle is revolved. Direct gear is made when the primary gear slides into the telescoping gear on the hollow axle, giving 18 chances for engagement in every revolution.

The cone clutches, made by this company, match exactly with the transmission, both being suitable for transmitting from 30 to 60 hp. The control levers are drop forged for both selective and progressive transmission. The universal joint is the well known "Hussey" type, with all bearings adjustable to wear.

Manufacturers Foundry Co.

This firm, located at Waterbury, Conn., produced 60,000 cylinder castings last year, which evidence of experience in this difficult branch of industry is a pretty clear indication of the soundness of its manufacturing methods and the skillfulness of its pattern makers. It also machines cylinders to drawings and tests jackets under water pressure.

Wm. Cramp & Sons, Philadelphia

This firm exhibited bearing metal castings, aluminum castings, bronze castings possessing high tensile strength and elastic limit, and also bronze castings of light weight. Probably the most important of the castings made by this company for the automobile trade are the manganese bronze front and rear axles for both light and heavy vehicles, although a hundred or more automobile castings are made.

MOTOR TRUCKING COMPANY

WITH a capital of $50,000 the Motor Transit Company has been organized to do motor trucking in Buffalo. The incorporators of the company are Seward H. Milliner, Joseph J. Lunghino, William J. Statler, R. J. Seidenberg, Lawrence P. Baker, of Buffalo.

It is reported that a motor bus operating over an 80 mile route in Nevada earned close to $30,000 during the past year carrying passengers at $25 one way. No other speedy mode of conveyance was available.

A VERY MARKED ECONOMY

A VERY interesting statement touching the economy of the power wagon was recently made at a public gathering by one of the directors of the famous match firm of Bryant and May, which concern has adopted motor vans in place of horse vans for the delivery of its products within a radius of twenty-five miles of the factory. Up to this distance it has been the custom to employ horses, and the average cost per gross for the delivery of the matches was 2.34 cents. As soon as the motor delivery vans got to work and the horses were discarded the cost was brought down to .88 cents.

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Correspondence

The editor invites correspondence on all subjects connected with the use or design of power wagons. No responsibility, however, is accepted for the views expressed by correspondents. No letters from firms engaged in any branch of the power wagon industry, which may be regarded as mere advertisements of their products, will be published. However, as many of the most practical suggestions come from those engaged in the industry, their communications upon matters of general interest will be especially welcome.

A Failure and its Cause

To the Editor—Recently it was announced that Aultman & Company, large dry goods merchants of New York City, were erecting a five story building for the accommodation of its horses and wagons, which undertaking was held to imply that the establishment would not increase its investment in motor wagons. There is no reason to doubt the truth of this conclusion, for the firm in question, during all the time it has employed motor wagons, has exhibited administrative stupidity which almost surpasses belief.

Any one who can get the ear of the executives of Aultman & Company will be told that the electric vehicles which they employ are both expensive and unreliable. He will also be told that gasoline wagons are no better than electric, as the prime movers require chauffeurs whose salaries are fixed at $25 a week, and who are so scrupulously careful about being classed as deliverymen that they will not put a finger upon a package of merchandise, thus making an extra man necessary in the operation of a machine.

Some years ago, when Aultman & Company purchased electric wagons, they did so without the slightest idea that the machines possessed any money earning power. The vehicles were bought for their value as advertisement. If any one doubts the accuracy of this statement his unbelief will soon be dissipated by going to the firm and inquiring how much was paid for the bodies of the vehicles. They cost $500 apiece. This is but one symptom of the extravagance which has marked this installation. The machines purchased were of an early type, in fact today they constitute what a caustic critic has described as a "museum of mechanical miscellany."

Rebuilding these old machines has somewhat improved their efficiency. If they were given the intelligent care which they deserve, they would not be, as Aultman & Company aver, unreliable.

Aultman & Company's belief, that it is impossible to obtain the services of a gasoline wagon driver at less than $25 a week, is too absurd to require refutation. It is doubtful if any concern in the country is paying such fancy wages to the driver of a gasoline motor truck. Fifteen dollars a week would be above the average.

It may interest people who believe that Aultman & Company's experience with electric wagons in the common one, to know that an offer was recently made by a large establishment in New York City for the delivery of 150 electric machines at the rate of one a week during a period of three years. The manufacturing firm to which this offer was made was so busy that it could not consider the order.

How are we to account for the eagerness of this purchaser? How did he gain the impression that the use of electric wagons would justify such a heavy expenditure as he contemplated? Was it by consulting with Aultman & Company?

INVESTIGATOR.

* * *

An Absurd Rule

To the Editor.—Among the many ridiculous rules which were formulated by the Automobile Club of America for its motor wagon contest—now happily abandoned—none was more absurd than that governing the relation of live load to dead weight. The club prescribed that each competing wagon need not carry more than 50 per cent. of its dead weight as a live load. A vehicle which can only carry one-half of its dead weight in the amount of live load would not be a very attractive proposition to us if we were the buyers instead of sellers. This rule was a fair sample of the rest.

JAMES MACNAUGHTAN CO.

* * *

Safe and Economical Speed

To the Editor—Relative to the speeds at which power wagons should be operated in order that maintenance costs shall not be unnecessarily high, permit me to remark that it is the practice of Claflin & Co., dry goods merchants in New York City, employing fourteen electric delivery wagons, to discharge drivers who speed the machines above 10 miles an hour. There is another reason than economical maintenance would suggest for this prohibition. The firm does not wish its drivers to run risks while driving the machines. Low speeds are safe speeds. Collisions are rare in the Claflin service.

V. H. W.

A motor bus line is to connect the towns of Romeo and Imlay City in Michigan, 18 miles apart. For several years the people of the latter town have hoped that somebody would build an electric line to connect with the Detroit United Railway line at Romeo. Two years ago a survey was made, the citizens raised a bonus of $10,000 and bought the right of way for the proposed company. Many promises were made, but for one reason or another they were never fulfilled. The motor bus solves the difficulty. The fare one way will be 50 cents.

In convention the rural mail carriers of the State of Indiana recently declared that they must have $250 a year additional for the care of their horses. It was stated that the cost of caring for a horse alone was not less than $20 monthly, to which must be added harness and vehicle repairs. Carriers who had made use of automobiles on their routes stated they were not as expensive by half to maintain as horses. There are about 1,900 carriers in Indiana.

The Landaulette Motor Cab Company has been organized in London with a capital of $375,000 to operate 150 public service motor vehicles. The vehicles will cost $1,500 a piece and will be fitted with taximeters. They will be of from 8 to 10 hp., giving speeds of four, twelve, and eighteen miles an hour. The cabs can carry five persons in addition to the driver, with provision for luggage.

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The Soiling, Costly Horse

Unclean and Badly Kept Streets Result From the Extensive Employment of Draft Animals

PROBABLY the only matter about which draft animal and power wagon owners are in thorough agreement is the necessity for keeping street surfaces clean. But the motives which animate each to crusade for the betterment of existing conditions have very little in common. Power wagons do not cause expense to the municipality. Neither scavenging carts nor road repairers follow in their wake. They represent economy in the highest sense, private as well as public. Draft animals, on the other hand, soil and destroy the streets they use. Their labor is wasteful.

The power wagon owner, secure in the enjoyment of superior traction under existing street conditions, can afford to tolerate pavements which are well nigh unendurable for horses. The team owner, watching his horses slipping, stumbling and falling, selfishly concludes that a hard and comparatively smooth surface is unsuited to vehicle traffic. This is equal to asserting that street pavements should, first of all considerations, accommodate the physical infirmities of the horse. Thus it follows that the best traction surfaces are unsuitable for draft animals.

Several suggestions have been made for the purpose of making asphalt safe for vehicles, particularly in wet or icy weather. Strewing the surface with sand appears to command the most attention, both from team owners and automobile users. But as the sanding of asphalt is a duty which is invariably dodged by municipalities, even when paving companies fail in their engagements to perform the work, the unfortunate vehicle owner is forced to seek some other remedy. In his despair he suggests that the asphalt, when being laid, be cut into ridges or blocks, which would give horses sure footing. The objection to this would be the unsanitary condition of the street, which, not being smooth, could not conveniently be kept clean.

The irregular, unsanitary, noisy, hoof-destroying, wagon wrecking granite pavement is the result of a vain attempt to afford safe and durable footing for horses. It is not economical; that is to say, it causes greater evils than it prevents. Draft animals soon become useless when driven over granite blocks; their feet become sore from the force of repeated shocks. The ordinary wood block pavement is even less satisfactory; it does not wear well, and when the surface becomes uneven, causes a great increase in the tractive effort. Its other disadvantages are low resistance to heat, moisture and wear.

The ideal street surface for a horse would be a substance into which he could dig his feet and thus exert the greatest leverage. But sanitary science denies the poor brute this convenience. Mankind is willing to tend and wait upon him, but insists that the dirty work of scavenging be not greater nor more expensive than his services are worth. People are somewhat weary of this rendering of disagreeable service to inefficient servants.

However we regard the horse he is an expensive agency in the human economy. His incapacity for arduous work is not the least of his disadvantages. We are accustomed to consider his maintenance as cheap. Actually, the converse of this is true. We lay down expensive street pavements for him, which he quickly destroys. Durable pavements, as has been pointed out, impair his powers. We annually expend more money in cleaning our cities, towns and villages from the foulness he discharges than would re-stock the earth with his kind. We toil for him, sicken from his filth, die from it. What disgusting humility we show! What a waste of precious life, labor and money! Is it any wonder that even the meanest of humanity hopes and aspires to be relieved from a tribute so shameful through the substitution of mechanical road traction? In our sordid contemplation of the temporary advantages which draft animals are supposed to possess we have unconsciously sunk to the level of the barbarians, who from stern necessity were compelled to admit beasts of burden to equal rank with themselves. Man, the master, is slave to the animal which drudges for him. Our nice sensibilities will not permit children to toil for us, but we, their guides, philisophers and friends esteem it a privilege to clean a stable.

The commercial use of the horse is a habit, a vice if you please. But, fortunately, habits which possess no great merit are permitted to fall into a state of innocuous desuetude. Only the fittest things survive.

MARKED ADVANTAGE OF MOTOR VEHICLES

LAST month the German government appointed representatives to witness tests intended to demonstrate the superior control of motor vehicles over horse-drawn vehicles of the class usually employed in public service. A motor cab competing with a horse cab stopped in five or six yards against thirty yards for the horse-drawn vehicle. A 50 hp. automobile, running twenty miles an hour, was stopped in two feet. A landau drawn by two horses competed against the car and it was not stopped until it had gone nearly 19 yards. A motor omnibus, filled with passengers, was brought to a standstill twelve yards from the braking line, while an empty horse-drawn omnibus required 19 yards in which to come to a standstill.

The sum of $3,000 has been appropriated by the city of Oakland, Cal., for the purchase of a motor police patrol wagon.

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Prof. Lucke's Alcohol Tests

Columbia University Professor Says Present Carburetters May be Used for the New Fuel

SOME time ago Professor Lucke of Columbia University was appointed by the national government to investigate the possibilities of denatured alcohol as a fuel for internal combustion engines. After many experiments he reports, contrary to general expectation, that alcohol may be used to advantage in the ordinary type of carburetter and without any alterations in its structure. Slight changes in the proportions of the fuel vapor and air are necessary, however, the greater sensitiveness of the alcohol mixture to atmospheric conditions brought about by changes in temperature and humidity requiring greater nicety of adjustment and a more frequent modification of the settings than is required with gasoline.

All of the professor's experiments were conducted with 1906 engines, the success of the new fuel being most marked with those having low compression. It is very hard to start a high compression motor on alcohol. Weather conditions affect alcohol much more readily than they do gasoline.

In driving it is found that the alcohol explodes better when the spark is carried well advanced and the needle valve in the carburetter well open.

Thumping in the engine, due to pre-ignition when gasoline is used, is not noticed with alcohol. In fact, intense heat and an advanced spark even in very hot weather all tend to assist the new fuel to act. Thus it can be seen hill climbing in summer with air-cooled motors will be made easy.

In the winter time, Professor Lucke thinks, it will be necessary to use some of the heat from the exhaust to warm the air as it enters the carburetter. Alcohol otherwise will not become a popular winter fuel.

In the matter of consumption it is noticed that while more power and greater speed is obtained, alcohol is not going to be a particularly economical fuel unless it becomes very much cheaper than gasoline. The consumption in volume is from one and a quarter to two and a half times greater than gasoline.

The odor from an alcohol motor is not unpleasant. Chemists call it aldehyde. Neither does alcohol carbonize the cylinders like gasoline. Some experimenters in Europe said they found acetic acid in the cylinders after the motor was run with denatured alcohol for a time, but Prof. Lucke has failed to discover any. He could not detect any trouble with the ignition, and there was no condensation on the spark plugs as might be expected from a fuel containing some water.

* * *

Recent experiments with internal combustion engines make it seem probable that a much greater efficiency can be obtained from them than has yet been developed in practice. It is well understood that in internal-combustion motors a high degree of preliminary compression is necessary in order that a high efficiency be obtained. The charge drawn into the cylinder must be highly compressed on the return stroke, before ignition takes place, and the higher this compression pressure the better the efficiency.

When a spray of water is injected into a highly heated cylinder the water will be immediately vaporized, this acting to lower the temperature and at the same time convert the heat into mechanical energy, acting through the expansion of the steam upon the piston. While this action does take place, it is found in practice that the efficiency of the engine is lowered by the injection of water. During the past few years, however, there has been designed an internal-combustion engine in which the vapor of water is used in the cylinder, and which, apparently contrary to theory, has shown a very high thermal efficiency.

In this motor a fine spray of water is injected into the mixed charge of air and hydrocarbon vapor in the suction pipe, and vaporized by the heat of compression, the absorption of heat thus effected enabling a high degree of compression to be used with safety. The economy due to the high compression overbalances the loss produced by the moisture, and the net gain is sufficient to account for the high efficiency of the motor.

Assuming that the real object of the water is to keep down the compression temperature and thus permit a high degree of compression, it is important that the quantity of water should be kept at a minimum, and that it should all be vaporized during the compression. It is important that the injection should not take place until the temperature of the compression reaches that of the vaporization of the injected liquid at the corresponding pressure. At the end of the stroke there should be a slight excess of temperature in order that the vaporization should be completed, this insuring the absence of any liquid drops to abstract heat from the ensuing combustion. This sequence of events may be regulated by experience, data for computation being as yet uncertain.

Thus far the injection of water alone has been considered, but the idea may be continued further. If, instead of vapor of hydrocarbon, not miscible with water, we use a fuel, such as alcohol, with which water may be mingled in all proportions, it is possible to extend the principle. The principle holds good for either a two-cycle or a four-cycle engine. The charge of pure air is compressed until the compression temperature exceeds that of vaporization of the alcohol fuel, at which moment the alcohol is injected and vaporized together with its contained water. The degree of compression desired may be controlled by the proportion of water, this being kept as low as possible consistent with the prevention of premature ignition.

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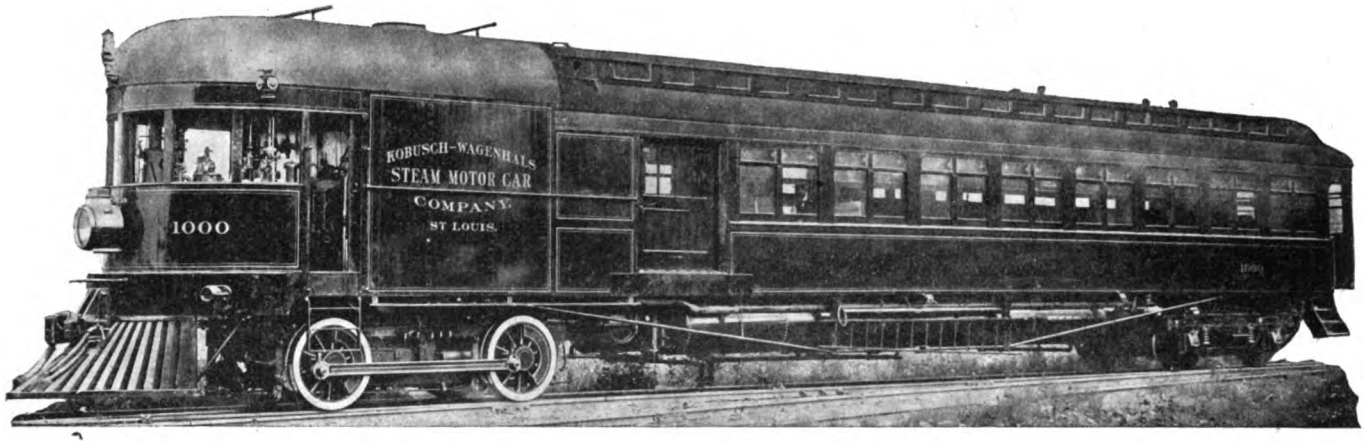


Unit Rail Motor Cars

Special Traffic Being Found for These Modern Cars Owing to Advance in Automobile Engineering

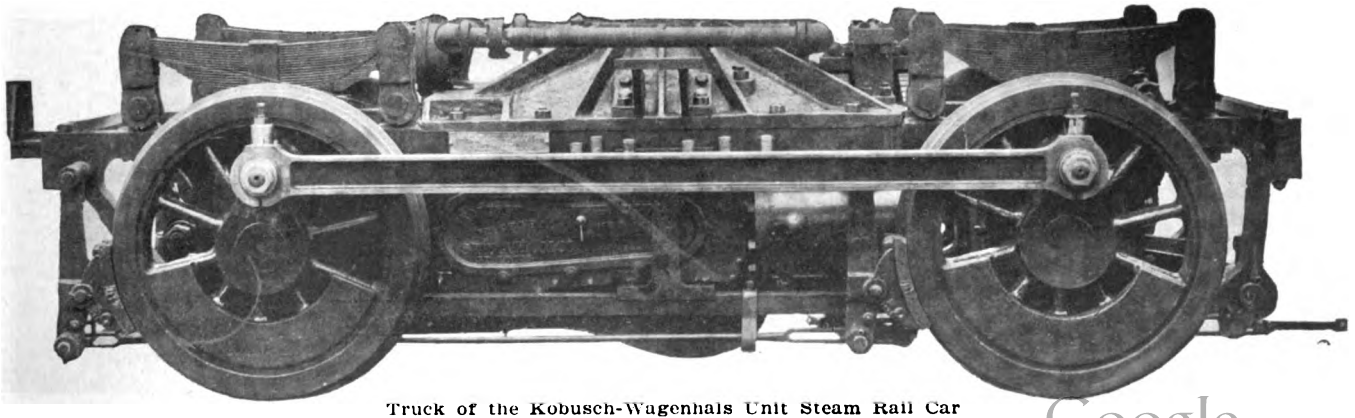
AS it is obviously impracticable, under any but the most favorable circumstances, to make use of ordinary steam railway trains in meeting the demands of a frequent service, operating costs and capital outlay being too great in proportion to the number of passengers carried, it is easy to account for the extraordinary interest being taken in the individual unit car, whether of the straight gasoline, gasoline-electric, or steam type.

One of the advantages of individual unit rail cars is the increased frequency of service it makes possible without correspondingly high expense for maintenance. Another is the rapid rate of acceleration, which makes the through speed higher. The experience of the railways which have given these cars an extensive trial proves that they are equally advantageous for heavy and sparse traffic. In heavy work the small units sandwiched between the regular trains find a traffic without taking it away from the trains, while in light work the traffic has been developed by the more frequent service. The number of single unit cars at present running, and the ever increasing number both at home and abroad, proves their utility, and it seems certain that in them steam railways have the only effective weapon to oppose against the competition of paralleling trolley lines.

Heretofore gasoline and gasoline-electric independent unit rail motor cars have monopolized the attention of railway operators. But the modern steam car of this type is now here to dispute honors with them, the Kobusch-Wagenhals Steam Motor Car Co., of St. Louis, being sponsor for it. The senior partner in this concern is president of the St. Louis Car Co.

This steam car is 82 feet long and weighs 89 tons, 53 tons of which is at the forward end. The engineer's compartment, which is 12 feet long, is constructed of steel. The coach seats 64 passengers.

A marine type, water tube boiler occupies the space immediately ahead of the baggage compartment. This boiler has 1215 sq. ft. of heating surface and carries a working pressure of 250 lbs, per sq. in., though it is built for a cold water test of 500 lbs. It is fired with crude oil through five burners of special design. One thousand gallons of oil are carried in a tank underneath the car body. In this tank the oil is heated by a portion of the exhaust steam and a presure of air, obained through a reducing valve from the main reservoir of the brake system, forces the oil up to the burners, where it is sprayed by either steam or air, or both, as may be desired. Owing to the high steam pressure as well as the desirability of easy feed control, a marine type boiler feed pump is used instead of an injector. Two thousand gallons of water are carried in two tanks also under the body of the car, and the feed water passes



Truck of the Kobusch-Wagenhals Unit Steam Rail Car

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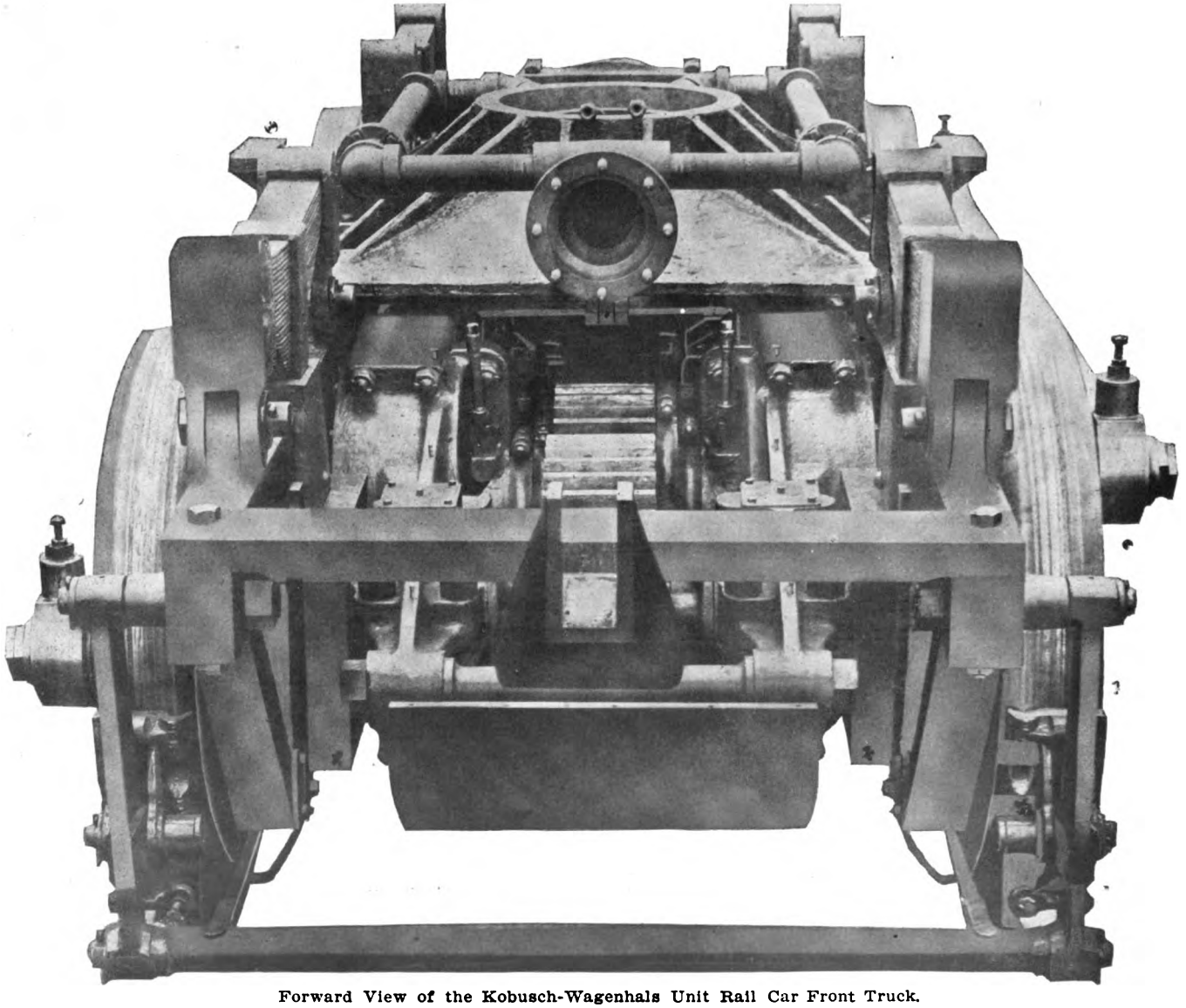
through heating coils at the top of the boiler before entering the boiler proper. In addition to the boiler and its attachments, the compartment contains a 9 1-2 in. pump and a complete brake equipment. The throttle, reverse levers and other controlling devices are all within easy reach.

The main steam pipe runs from the boiler (over head) to the front of the compartment, where it is turned down and runs through the floor to a casting which is the female part of a flexible joint.

The most striking feature of the car, however, is the motor truck, the arrangement of which has been cleverly worked out. Instead of following locomotive precedent Mr. Wagenhals, the designer, has really taken street car precedent and practically exchanged a steam motor for the electric motor which is geared to one axle. Side rods have been added to utilize all four wheels. A double cylinder, piston valve, 275 hp. engine has the frame of its cylinder end hung on a single point spring suspension just back of the truck center casting. At the other end, the engine frames are extended beyond the crank shaft so as to rest on and be supported by the axle of the forward wheels. This affords a three point suspension for the engine, while a still further extension of the engine frames enable the two to be rigidly connected by means of the heavy shouldered bolt. A pinion on the crank shaft meshes with a gear wheel on the axle, in the same manner as with electric motors. The wheels are 42 ins. in diameter, and with the present size of pinion and gear a tractive effort of 8,000 lbs., or a speed of 40 miles per hour is secured. The exhaust is used to heat the coach and the fuel oil, though it is directed out the stack when not required for these purposes. The trailer truck is of the standard M. C. B. four-wheel type.

In operation one is struck particularly with the entire absence of vibration due to the working of the engine. Another point which impresses one is that only three or four easy disconnections are necessary to enable the truck to be run out from under the car for repair or exchange with another truck. Within a few days the car will be sent on a demonstration trip around the country, in the course of which it will be placed on exhibition in the depots at the large railway centers. Following this it will be put into regular service on the Missouri Pacific Railway.



Forward View of the Kobusch-Wagenhals Unit Rail Car Front Truck.

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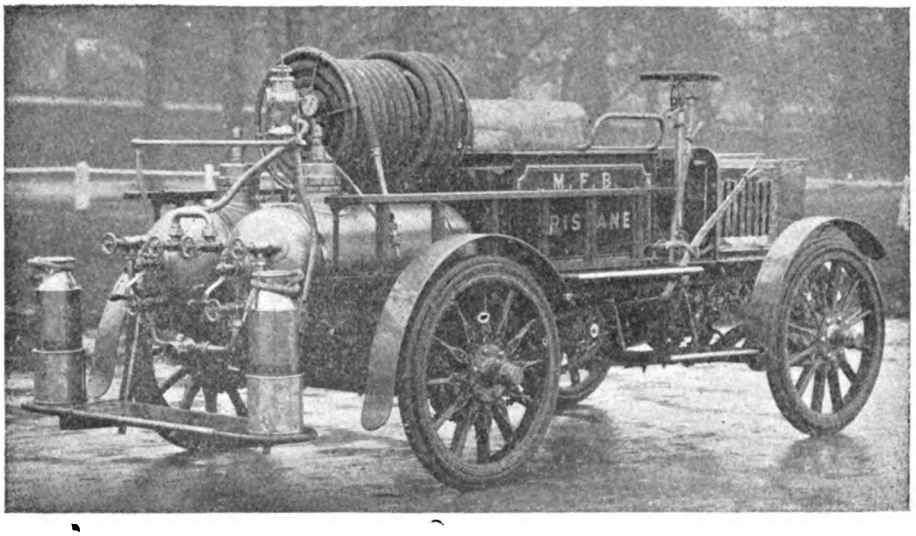

Motor Fire Vehicles

Comparison Between the Various Power Systems Employed in Fire Department Service

IN a recent issue we referred to a few of the advantages of the front wheel drive over the rear drive. Following is a comparison of the merits of the two systems, which takes into account the risk to the power plant from collisions to which fire vehicles are very liable:

Comparison Between Motor Fire Vehicles With Rear Wheel Gasoline Drive and Front Wheel Electric Drive

	Rear Wheel Drive	Front Wheel Drive
Steering capacity	Quarter lock only	Full lock.
Mechanical efficiency	Very low, as motor has to drive backward to gear which drives or pushes vehicle forward.	Very high, as motors rotate wheels direct and pull the vehicle, which is easier than pushing.
Skidding	Considerable through differential gear, live axle, or chain drive.	No danger of skidding, as front wheels have accommodating speeds and draw rear wheels into uniform speed and directions.
Safety in case of collision	1. Side concussion against frame bends it, causes gears or chains to miss, and vehicle breaks down.	Frame bends—motor in front is unaffected and vehicle proceeds to fire.
	2. Front concussion hits engine and damages cylinders, radiators, etc.	Hits electric motor on side of greatest concussion—motor breaks and is rendered useless; second motor on other side unaffected and pulls vehicle to fire
	3. Rear concussion affects chains or gears. Vehicle breaks down.	Bends frame—does not affect front drive and vehicle proceeds to fire.

Steam rear drives are at a greater disadvantage than gasoline rear drives and electric front drives, because there is the added risk of explosion of boiler and escape of scalding steam, as well as danger from the fuel supply firing, the latter a danger also present in gasoline vehicles, but entirely lacking in electric vehicles. The gasoline-electric drive has some advantages over the simple gasoline vehicle even though it be front driven.

The table to be found on the next page presents a comparison between the various power systems in use on motor operated fire vehicles today. It will be found useful for other purposes than arriving at a knowledge of the merits and demerits of the various motive powers. Of the twelve points mentioned, nine are in favor of the electric vehicle as against all the others. As no value, however, has been given to these points it is difficult to arrive at a fair judgment as to which is the best all round system. The high high cost of the electric vehicle must be taken into account. We will, therefore, give the items the following respective values according to their importance in fire brigade work:

No. 1 . . . . . 20 points
No. 2 . . . . . 20 points
No. 3 . . . . . 10 points
No. 4 . . . . . 30 points
No. 5 . . . . . 10 points
No. 6 . . . . . 10 points
No. 7 . . . . . 50 points
No. 8 . . . . . 50 points
No. 9 . . . . . 40 points
No. 10 . . . . . 30 points
No. 11 . . . . . 50 points
No. 12 . . . . . 50 points

The highest number of points obtainable is 370.

The award of points on a fair comparison of the respective advantages held by each system as against the other three is as follows:

	Steam	Gasoline	Gaso.-elec.	Electric
No. 1	20 points	10 points	15 points	15 points
No. 2	6 points	8 points	10 points	20 points
No. 3	8 points	8 points	9 points	10 points

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TABLE OF COMPARISON BETWEEN POWER SYSTEMS OF MOTOR FIRE VEHICLES

	STEAM	GASOLINE	GASOLINE - ELECTRIC	ELECTRIC
1. Speeds.	Zero to 30 miles	3 ahead, 1 reverse.	5 ahead, 2 reverse.	5 ahead, 2 reverse.
2. Levers and controls generally.	Throttle, pump, injector, oil burner, brakes, reverse, lubricant—seven in all.	Speed and reverse, ignition, throttle, brake, lubricant —six in all.	Ignition, throttle, brake, controller lubricant — five in all.	One for electric brakes and speeds, and one for mechanical brake—two in all.
3. Horse Power	25 to 30.	25 to 30.	Limited by motor—25 to 30	Up to 80 for emergencies.
4. Power Gears and parts.	Cylinders, boiler, link motion, water tank, fuel tank, differential gear, chains or transmission gear.	Cylinders, carburetter, sparking plugs, or make and break magneto, coil, battery, differential gear, chains or other final transmission, fuel and water tanks.	Cylinders, carburetters, sparking plugs, magneto or other igniter system, dynamo-motor, transmission gear, storage battery, fuel and water tanks.	One set of batteries with two cables, two motors and transmission.
5. Weight	4 tons	4 tons.	4¼ tons.	4¾ tons.
6. Gross capacity.	Unlimited mileage.	Unlimited mileage.	Unlimited mileage.	Limited to 30 miles, which is more than sufficient for fire work.
7. Turning out for service.	Lighting burner, getting up steam and mounting, (if steam always kept sufficient to start) 60 seconds.	Starting engine and adjusting ignition, etc., mounting, 30 seconds.	Same as gasoline if no storage kept, 30 seconds.	Driver mounts, switches on current and is off. Practically instantaneous.
8. Upkeep per car mile.	Fuel, lubricant and repairs, 6 cents per cubic mile.	Fuel, lubricant and repairs, 7 cents per cubic mile.	Fuel, lubricant and repairs, 6¾ cents per cubic mile.	Cost of power and 20% depreciation of batteries, 5 cents per cubic mile.
9. Reliability of Power.	Dependant upon expert driving and keeping up of steam.	Dependant upon expert driving, vaporization of gasoline, and ignition which often break down.	Same as gasoline, with added risk of trouble with dynamo-motor and storage battery if any.	Power already stored and cannot refuse to act.
10. Driver.	Must be expert.	Must be expert.	Must be expert.	Anybody can drive
11. Price.	$4,250	$4,750.	$5,000.	$5,750.
12. Mechanical efficiency loss.	15 per cent.	20 per cent.	25 per cent.	5 per cent.

No. 4...25 points	15 points	20 points	30 points
No. 5...10 points	10 points	8 points	4 points
No. 6...10 points	10 points	10 points	10 points
No. 7...20 points	40 points	40 points	50 points.
No. 8...40 points	30 points	33 points	50 points
No. 9...35 points	30 points	20 points	40 points
No. 10...25 points	20 points	20 points	30 points
No. 11...50 points	40 points	35 points	10 points
No. 12...30 points	20 points	10 points	50 points
Total...279 points	241 points	230 points	319 points
Losses.. 91 points	129 points	140 points	51 points

Thus we find that for fire brigade work (and this valuation will not apply to any other class of work) the electric drive is best, although the capital outlay is one-third more than for a steamer. Second on the list comes steam. Gasoline comes third, and gasoline-electric fourth.

We should mention here that the table of motive power comparison was drawn up from figures obtainable in actual running of the respective classes of motor fire vehicles described, many of the figures being given by fire chiefs at the last Milan International Fire Congress.

It will be noticed that the actual cost of running these four different power systems is much about the same, only two cents separating the highest and lowest costs. We have not mentioned in the comparative tabulation any charges for driving, depreciation and tires, as so much depends upon local conditions, but any of our readers who wish to complete the comparison can easily do so on referring to the statistics relating to horsed and mechanically propelled fire vehicles previously given.

A company with $25,000 capital has been formed to operate motor buses from Delaware Water Gap to Portland.

The Missouri and North Arkansas railroad has inaugurated a gasoline rail car mail service between Eureka Springs and Seligman, the connecting point on the 'Frisco. This supplemental service will bring morning mail from St. Louis and Kansas City five hours in advance of first regular mail train to Eureka.

A speedy fire department vehicle is being tested in Boston. The body and useful appliances are mounted on a Packard chassis, fitted with 30 hp. gasoline engine driving through chains to the rear axle. The weight of the machine is 4,500 pounds. It has a speed of 30 miles an hour.

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MOTOR DRIVEN FIRE APPARATUS

IT would not be surprising if the introduction of motor chemical wagons did much to improve the fire fighting service. All firemen realize that the real secret of successfully coping with a blaze is to reach it before it has time to gather headway. Minutes, or even seconds, gained in bringing the apparatus to the flames means the saving of thousands of dollars in damages, not only because the actual fire loss is less, but also because a smaller amount of water is used, and the water damage is fully as great, if not greater, than that caused by fire and smoke in the great majority of instances. In the suburban sections particularly there should be a great field for the motor chemical wagon.

After horses have drawn a chemical engine to two fires in succession their pace to a third would necessarily be slow, particularly if the distance which the apparatus had to be hauled was great. With the motor-propelled car that handicap is avoided.

It is rather surprising that the motor car builders have not turned their attention to this matter before.—The Boston Herald.

WANTED—Motor bus, 10 to 20 passenger capacity. Apply to George H. Harrington, 11 Austin Street, Worcester, Mass.

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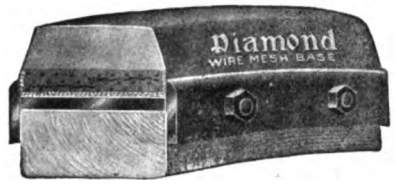
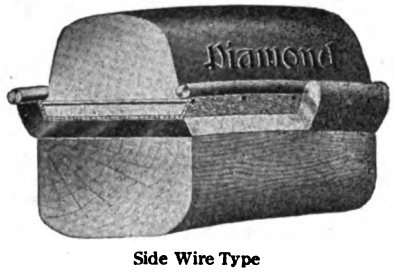
Quality in Commercial Vehicle Tires

means ultimate economy--acumulative saving, which, in a year, makes a big difference in the expense bill. Our literature goes into the truck tire question very fully.



Wire Mesh Base Type



Side Wire Type

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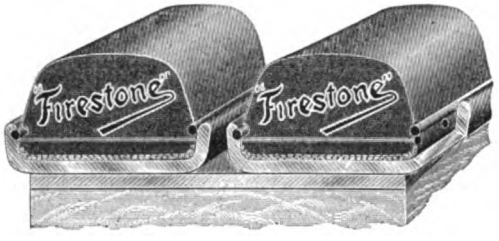

Dual Motor Tire for rear wheels of heavy cars. Duplicates any width of single tire and to do the heaviest work ever demanded of a tire.

The compounds and devices made by this Company are fully proven to be successful before being offered on the market.

The Dual Motor Tire has been adopted by several of the leading motor truck makers as regular equipment.

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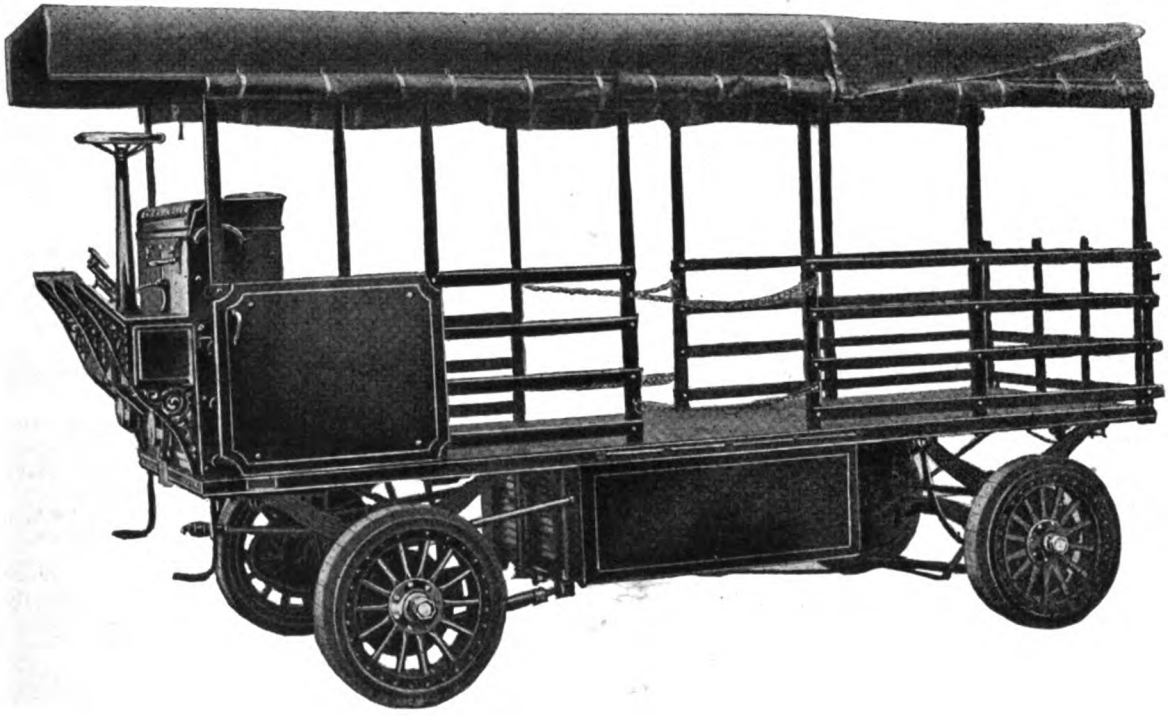

Perfect driving, steering and braking; no jar or vibration; draws less current than any electric truck in the world of its size.

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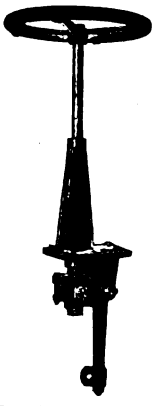
POWER WAGON PARTS

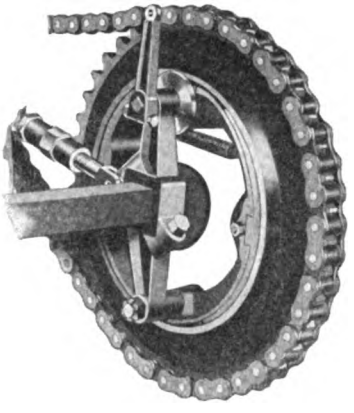


Steering Gear—Also Pinion and Sector Type

For four years we have been making parts for light and heavy gasoline and electric power wagons. The experience gained in that time gives us an enviable advantage in knowledge of what constitutes correct and serviceable design.

In short, we have long since passed the period when our products have to be road tested in order to determine their suitability for power wagon service.

Less experience than we possess puts the burden of experiment on the customer.



Brake—Made in three sizes

When you purchase Garford parts you get the accumulated benefit of our long study of power wagon problems, commercial as well as mechanical, the influence of which is inevitably manifested in all our designs.

We are power wagon parts making experts who for years have been studying the problems of this new industry. If we enjoy the reputation for possessing more first hand knowledge of design than any concern in the country, it is because we have been longest engaged in such work.

Garford Motor Wagon Parts represent ripe experience. Don't forget that.

Front and Rear Axles	**Steering Gears**	**Distance Rods**
Motor Hangings	**Sprockets**	**Brakes**

The Garford Company

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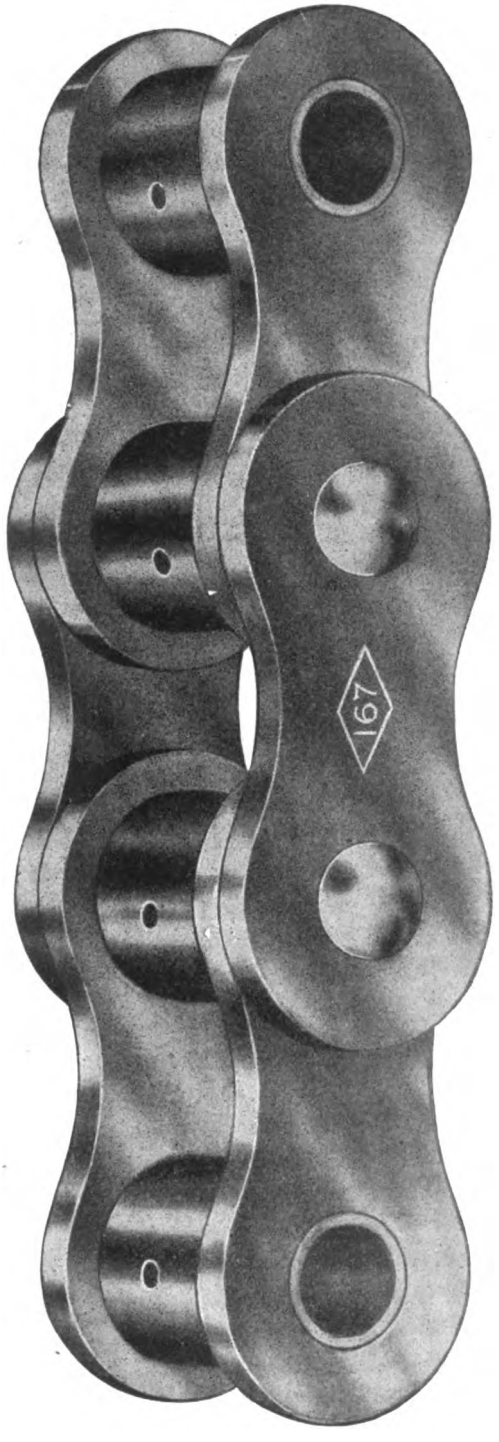

Are the chains on your power wagon giving satisfactory wear?

If not you will doubtless be interested in knowing that "DIAMOND" chains outwear all others.

This is not merely our own opinion, but the belief of the most experienced users of power wagons who have had their machines fitted with every chain on the market.

The extreme care exercised in the manufacture of "DIAMOND" chains is not their only recommendation for service. The stock in them is of a very superior order. For example, rivets are nickel steel. Only an engineer would appreciate the refinements of mechanical practice to which we resort in order to make "DIAMOND" chains superior to any others.

The strength of "DIAMOND" chains is due to the superior material used in their construction, their design and the precision of their manufacture. We never use defective material. In fact all material is very carefully inspected and tested before it passes into our work shops, and if the slightest imperfection is noticed the piece is rejected.

Outwearing other chains—stronger than others—more economical—isn't that about what you would expect in the product of the oldest, and largest chain making plant in the country?

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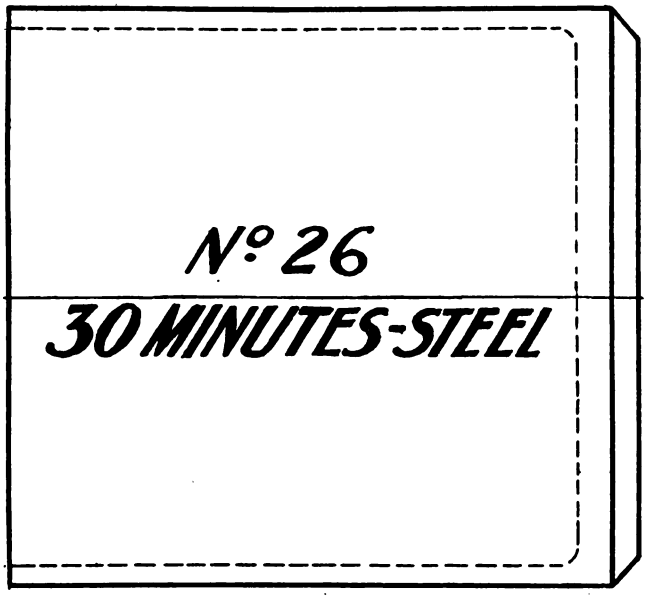

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PIECE NO. 26. Material, machine steel bar, made on a 3 1-4 inch Cleveland Automatic Turret Machine; drawing, full size; time of all operations for completing this piece, 30 minutes; actual cost of labor, from 3 to 4 cents, depending on the number of machines operated by one man.

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WOOD WHEELS

Few parts of a power wagon are subjected to so much strain as its wheels.

The loads to be supported, not less than the inequalities of the road surface, make it imperative that nothing but the very best material be employed in their construction.

But even the very best timber will not balance faulty design or careless manufacture.

"IMPERIAL" wheels owe their reputation for superior excellence as much to the refinements of orthodox methods of manufacture as to the careful selection of stock.

"IMPERIAL" manufacturing methods, joined to "IMPERIAL" second growth hickory, furnishes as good insurance as power wagon users can get.

Our wheels can always be depended upon to safely support light or heavy merchandise loads.

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Selling Agent—HAYDEN EAMES, American Trust Bldg., CLEVELAND, O.

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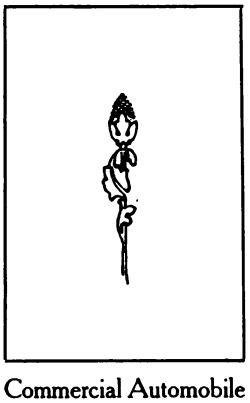

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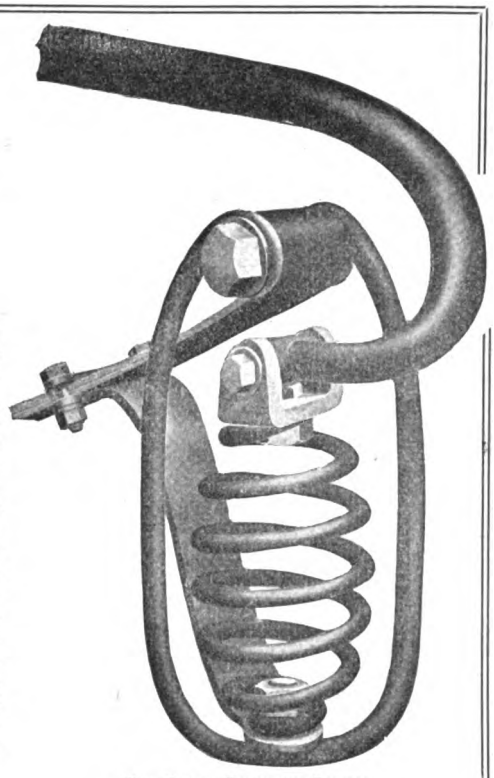
Save wear on the machinery of your power wagon by the use of our supplementary spring devices. SAGER "equalizing" springs prevent harmful recoil when load is applied and the road is rough. SAGER "Flexble" springs sustain the light loads.

As all fixed springs are designed for maximum loads it is impossible that they can be serviceable when no loads, or light ones, are being transported.

Invest in a set of both these supplementary springs. They soon pay for themselves.



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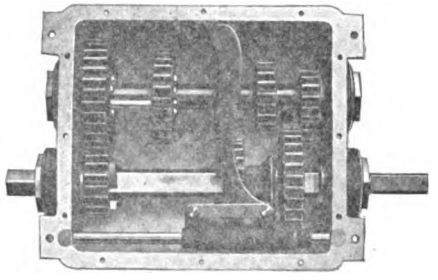

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Heinze Electric Company

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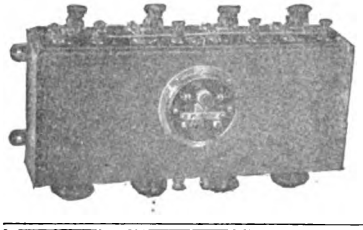
why every Power Wagon should be equipped with a

SPLITDORF COIL

is because it is

More Efficient, More Economical and Dependable

than any other coil made



With faulty ignition the Power Wagon becomes simply a "poor" wagon.

With SPLITDORF ignition you get every ounce of power there is in the engine.

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The best judges of ignition will tell you that the SPLITDORF is still foremost in point of quality

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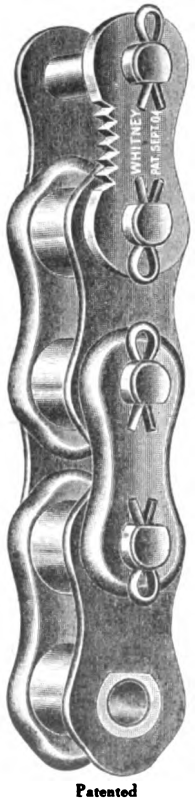

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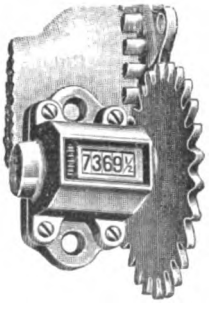
Light in Weight, but strongly built.
Simple to operate.
Carrying Capacity 1000 pounds.

HINDE & DAUCH, SANDUSKY OHIO



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Mileage AND Speed

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The NATIONAL SHOW

at which all makers of cars exhibit, will be held at

Chicago

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February 2-9

The buildings contain over 125,000 square feet of floor space, which will be occupied by

104 EXHIBITS OF CARS
190 EXHIBITS OF ACCESSORIES

Many of the principal makes of Power Wagons will be exhibited and demonstrated on Chicago streets during the show.

S. A. MILES, Manager
New Southern Hotel, CHICAGO

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A Paying Investment

Do you believe that, in the majority of cases, city merchandise can be more economically transported by power wagons than by horses?

Of course you do.

But do you know the extent of the economy to be gained by the substitution of motor trucks and wagons for horse drawn vehicles?

Few people do.

"The Power Wagon" proposes to assist every branch of business in which local transportation plays an important part, by showing how and to what extent motor vehicles may be used to advantage--the peculiarities of each business duly considered.

Possibly such work interests you.

If it does you should subscribe for the paper.

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Gear
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3 Speeds

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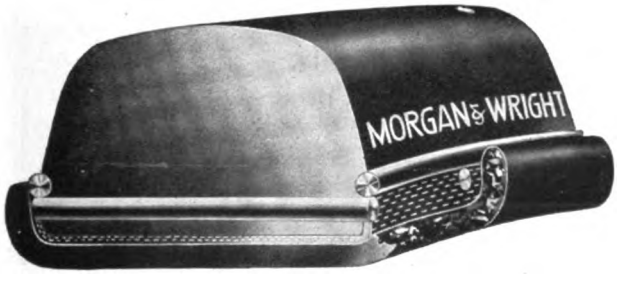
ARE HELPING TO REDUCE TIRE EXPENSE BILLS

THE side-wire principle incorporated in this tire has fully demonstrated, in actual, every-day service, that it is the most *reliable* principle in use at the present time. In addition to this advantage, the tire *stock* is extremely tough and is giving its users *considerably more service* than they have been getting from tires of this type.



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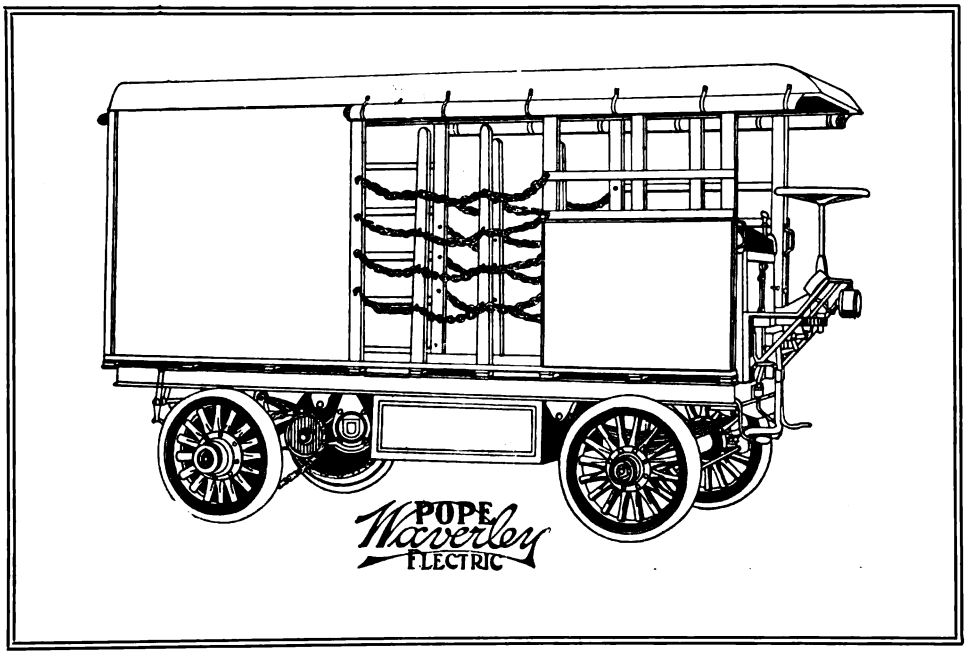
Three Ton Trucks



Can Ship Duplicate of the Above Immediately

SPECIFICATIONS

WHEEL BASE - - - -	118 inches
TREAD - - - - -	73 inches
WHEELS, Wood, fitted with 36 in. by 5 in. solid rubber tires.	
MOTORS, General Electric, two, hung from body in front of rear axle, double side chain drive	
CONTROLLER - -	General Electric
BRAKES - -	One on each rear hub
STEERING -	Wheel, with sector and pinion
BATTERY -	42 Cells, 15 M. V. Exide or W. B. National

Length over all, 16 ft. 5 in. Width over all, 7 ft. 3 in.
Clear carrying space, 13 ft. by 4½ ft., by 6 ft. high

Write for Particulars

POPE MOTOR CAR COMPANY

POPE Waverley ELECTRIC AUTOMOBILES

WAVERLY DEPARTMENT **INDIANAPOLIS, IND., U. S. A.**

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

NO. 27 FEBRUARY, 1907 NO. 27

PUBLISHED THE FIRST OF EVERY MONTH BY
THE POWER WAGON PUBLISHING CO.

SUBSCRIPTION RATES:

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ONE YEAR (FOREIGN)	3.00
SINGLE COPIES	.20

PUBLICATION OFFICES:
AMERICAN TRUST BUILDING
CLEVELAND, OHIO

ADVERTISING RATES ON APPLICATION

WALTER WARDROP, EDITOR

Entered as Second-Class Mail Matter at the Postoffice at Cleveland Ohio, Under the Act of Congress of March 3, 1879.

Intelligent Cost Comparison

How Owners of Horses and Wagons May Know if it Will Pay to Replace Them by Power Wagons

EXAMPLES of intelligent decision in concluding to employ power wagons instead of draft animals are so rare as to cause amazement among those who know how easily the substitution can be justified.

Of the thousands of machines now in use the big majority have been purchased with the hope that they would weakly demonstrate a suspected economy, rather than strongly confirm it. The timid employment of a few motor vehicles in services which might rely upon them exclusively, has resulted in checking many an ambitious plan for the wholesale substitution of horses. The modest venture gave little or no indication of the enormous saving to be accomplished by total replacement. The principle of economy may be demonstrated by petty experiment, but its true and large proportions are obscured until mass conversion occurs. Detached experiment is attended by another disadvantage. It is often badly supervised; and when it is revolutionary in character—as when a single power wagon is introduced into a stable of horses—it is sure to evoke hostility among workmen who are not easily broken to new responsibilities.

* * *

If a word of well-seasoned advice might be given to those who contemplate the purchase of power wagons it would take this form: be sure of your horse transportation costs, then go ahead. The biggest successes are those which have been executed in a spirit of boldness. Big undertakings call forth the best qualities of administrative judgment; little ones command only the attention of inferior workmen.

The assumption of the power wagon's economy is merely a matter of simple arithmetic if one is prepared to concede the genius of the American mechanical engineer. Any accountant can figure it out. The superior range and load capacity of the vehicle enables the investor to save on the item of wages. Diminished stable room and less costly stable location represent gain in another direction. Add the ability of the vehicle to earn its own cost long before it will be worn out—if it is reasonably well cared for—and there are present the principal elements of its success.

* * *

But the confirmation of these well attested advantages is quite another matter. The first step toward that end consists in knowing what is the precise cost of the service which the power wagon is to replace. Until this is ascertained it is idle to discuss the cash value of the substitution for there is nothing with which to compare it. Uusually the cost of draft animal transportation is high or low, loosely or firmly defined, as the concern saddled with its maintenance happens to regard such work as a minor or major function of its commerce. And it not infrequently occurs that the very establishments one would imagine had every reason for keeping accurate track of transportation costs—such, for example, as cartage and express companies, or firms which live by the profit of such industry—are profoundly ignorant of them. Cost keeping is an art in which many dabble as amateurs and few ever become proficient. Rule of thumb suits the majority, which explains the persistency of error.

* * *

Cognizant of this common failing, the selling agent of several factories which produce power wagons has taken the pains to prepare dummy specification sheets which, when properly filled in, present a rough draft of the economy to be gained by the employment of motor vehicles in place of horses. That the most interesting of these documents considers only the use of electric wagons

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JAMES MACNAUGHTAN COMPANY

ELECTRIC COMMERCIAL VEHICLES

BUFFALO, N. Y.

Report of.....

.....

Condition of trucking and delivery by horse drawn vehicles as existing.....190

All items figured on a total basis of 12 months ending on the above date.

WAGONS

	Single Horse	Double Horse Light Wagon	Double Horse Heavy Trucks
Number			
Type (open platform or top)			
Average weight of wagon			
Average load capacity, pounds per wagon			
Average load carried, pounds per wagon per trip			
Average number of packages carried per wagon per trip			
Number of routes			
Average total miles traveled daily per wagon			
Average hours of use per day per wagon			

HORSES

Total Number of Draft Horses .....

" " " Light " .....

Average hours of work per horse per day.....

" miles " travel " " " .....

DRIVERS

Number of Drivers.....Wages per day..... Hours of labor per day.....

Number of Stablemen..... " " " _____ " " " " " .....

INVESTMENT

Total investment in wagons $.....

" " " horses $.....

" " " harness $_____

" " " accessories $.....

Total $_____

Sheet 1—Estimate of Horse and Wagon Investment and Work Performed by Same.

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OPERATING COSTS

For 12 months ending date of this report

MAINTENANCE

Repairs to wagons $.....

Repairs to harness $.....

Horses replaced $.....

" "feed" $.....

" "shoeing" $.....

" "Veterinary" $.....

Stable expense $.....

Total $.....

DRIVING

Total wages to drivers for 12 months $.....

" " " stablemen " " " $.....

Total $.....

DEPRECIATION AND INTEREST

Depreciation on wagons $.....

" " horses $.....

" " harness $.....

Interest at 6 per cent. on total investment $.....

Total $.....

RESUME OF OPERATING COSTS FOR 12 MONTHS

Maintenance $.....

Driving $.....

Depreciation and interest $.....

Total $..... Average Operating Cost per month $.....

Total of weights carried during 12 months..... tons

Whole number of packages carried..... packages

Total miles traveled..... miles

Cost per ton mile $.....

Cost per package mile $.....

Sheet 2—Estimate of Operating Costs for Horse-Wagon Investment.

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JAMES MACNAUGHTAN COMPANY
ELECTRIC COMMERCIAL VEHICLES
BUFFALO, N. Y.

Report of.....

.....

Condition of trucking and delivery by horse drawn vehicles as existing.....190

All items figured on a total basis of 12 months ending on the above date.

TRUCKING AND DELIVERY SERVICE

	Single Horse Wagons	Double Horse Light Wagons	Double Horse Heavy Trucks
Number			
Type (open platform or top)			
Average weight of wagon			
Average load capacity, pounds per wagon			
Average load carried, pounds per wagon per trip			
Average number of packages carried per wagon per trip			
Number of routes			
Average total miles traveled daily per wagon			
Average hours of use per day per wagon			

CONTRACT COSTS

We pay.....cents per.....pounds for car load quantities

" _____ " " _____ " " less than car load quantities

Paid on this basis during past 12 months Total $.....

Average cost per month $.....

We pay_____.....Dollars per day for single horse wagons

" ..... " " " " team wagons

Paid on this basis during past 12 months Total $_____

Average cost per month $_____ Total cost for 12 months $_____

Average total cost per month $_____

Kind of merchandise carried.....

Total of weights carried during 12 months_____tons

Whole number of packages carried_____packages

Total miles traveled .....miles

Cost per ton mile $.....

Cost per package mile $.....

Sheet 3—For Those Whose Cartage is Conducted by Contract.

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JAMES MACNAUGHTAN COMPANY
ELECTRIC COMMERCIAL VEHICLES
BUFFALO. N. Y.

Report of_____

_____

Approximate estimate of cost for trucking and delivery of merchandise by Electric Power Wagons for conditions existing _____ 190

All items calculated upon a 12 months basis.

ELECTRIC WAGONS

Type			
Number			
Average weight of wagon			
Average load capacity, pounds per wagon			
Average load carried, pounds per wagon per trip			
Average number of packages carried per wagon per trip			
Number of routes			
Average hours of use per day per wagon			
Average miles of travel per wagon per day			

ELECTRIC EQUIPMENT

TYPE OF WAGON	MOTORS					BATTERIES				
	Make	No.	Type	Volts	Amperes	Make	Type	No. Cells	No. Plates	Ampere Hours

DRIVERS

Number of Drivers _____ Wages per day _____ Hours of labor per day _____

INVESTMENT

Total investment in Electric wagons $_____

" " charging equipment $_____

Total $_____

Sheet 4—Showing Outlay Necessary to Make Total Conversion of Horse and Wagon Equipment

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OPERATING COSTS

Basis of 12 months service

MAINTENANCE

Repairs to Electric wagons $.....

Repairs to Motors $.....

Repairs and replacements to Batteries $.....

" " " " Tires $.....

Charging Current for Batteries (@..... per K. W.) $.....

Charging station expense $.....

Total $.....

DRIVING

Total wages to drivers for 12 months $.....

DEPRECIATION AND INTEREST

Depreciation on Electric wagons ..... per cent. $.....

Interest at 6 per cent. on total investment $.....

Total $.....

RESUME OF OPERATING COSTS FOR 12 MONTHS

Maintenance $.....

Driving $.....

Depreciation and interest $.....

Total $..... Average Operating Cost per month $.....

Kind of merchandise carried .....

Total of weights carried during 12 months ..... tons

Whole number of packages carried ..... packages

Total miles traveled ..... miles

Cost per ton mile $.....

Cost per package mile $.....

Sheet 5—Showing Operating Costs After Power Wagons Have Replaced Draft Animal Service.

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need not obscure the merit of the plan to arouse interest in comparison so instructive. Possessed of the knowledge the inquiry sheets are designed to impart, and fortified by the assurance that all important service conditions are known, it should prove a comparatively easy task for a competent student of road motor transport to prepare an estimate of the working cost of the power wagon installation. It is not the use of power wagons which insures their economy, but the art shown in their application.

From the figures in front of him, and the known conditions of service, it is impossible to conceive that this expert could err in assigning wagons to duty. Five-ton machines would not be pulling one-ton loads. Heavy transfer work would not be performed by vehicles which might be more profitably employed in faster service. There would be no misfits, no lost hours, no stale and unprofitable customs. But, above all, there would be no horses to interfere with the exercise of the freest economy, except in such cases as their retention was indicated to be of absolute value, a reservation, by the way, which experienced power wagon economists have occasion to make with more frequency than is generally supposed by enthusiasts who vainly imagine that the machine is always capable of yielding economy. Very short hauls by single teams are not rich in opportunity for motor wagons.

* * *

If reasonably correct answers are supplied to the inquiries implied in sheets 1 and 2—which are prepared for the benefit of those who own the horses and wagons they employ—an equally reliable estimate of the investment required for power wagons can be readily given, together with the approximate cost of maintenance based upon average experience. This estimate, however, will not reveal the full economy, particularly if the stable is a large one and happens to be located upon expensive real estate, or if the new service should chance to be entrusted to men of superior administrative ability. Good routing will work wonders in a power wagon service.

Sheet 3 is intended for those whose cartage is conducted by contract. With both forms of expense contrasted—horse-wagon hire with power wagon ownership—it is easy to see how much money is being wasted by evading an obligation which the majority assume. It is false economy to lose one profit. It would be idiocy to fling away two.

* * *

Sheets 4 and 5 are in reality blank indictments of the inefficient horse. If the service to be replaced is extensive, they will show a driver's wage economy of 60 per cent; a vehicle economy of 50 per cent, calculating spares; a stable room economy of 50 per cent, a stable labor economy of 100 per cent —to be modest; highly superior speed and distance qualities in the wagons, the latter, however, provided suitable arrangements are made for changing batteries during work hours; a distinct and judicious adaptation of power to service which may be termed maximum efficiency for each vehicle; hours of service only limited by the desires of the investor and not regulated to fit the infirmities of draft animals; a daily vehicle mileage to correspond; low repair and maintenance expense, which can be accurately gauged if ordinary wisdom is exercised in caring for the machines; and, finally, cheaper transportation cost, whether by package mile or ton mile, than can be educed from the employment of any other agency.

But the first cost will not be light. The successful use of the power wagon is a test of commercial courage. Its richest rewards are reserved for those who have the greatest need for its economy.

AMERICAN OPINION ON FRENCH MOTOR CABS

UPON returning from a visit to Paris, whither he ewnt for the purpose of examining the exhibits at the recent automobile show, the sales manager of one of our largest factories observed:

"All Americans are interested in taximeter motor cabs. I rode in them whenever occasion offered, and was much impressed with the two-cylinder vertical motors with which they were fitted and which seemed to have a great deal of power and to be practically vibrationless. I did not see a single cab broken down or delayed in any way while I was in Paris. The drivers rent these cabs, completely equipped, by the month, and all of them I talked with stated that the vehicles had paid them well for the six months, or thereabouts, they had been in use. Of course there was, naturally, some doubt among the drivers whether the coming period of repairs would reduce the profits enough to make the investment a bad one for them. This doubt, however, will be definitely set at rest during the year. There are about 2,000 more taximeter cabs ordered for use in Paris.

"In making cylinder castings the French are far ahead of us. The custom in America is to cast single cylinders. The French have outgrown this condition. They have reduced the possibility of blow-holes and other imperfections to a minimum, and therefore do not feel that they are taking any large chance in casting in pairs, and even in sets of four and six. This system of multiple casting is used in the construction of most of the taximeter cabs, such as those turned out by the C. G. V., Clement, Renault and other companies.

"I paid a visit to the C. G. V. factory and was particularly impressed with the high quality of its product. I rode in one of its 20-hp. taximeter cabs, and found it a wonder. The vehicle seemed to have at least 30-hp. It ran perfectly with very little vibration."

Motor bus transportation is not sold cheaply in the Goldfield mining district. Vehicles are to be operated this month over a specially built road from Johnnie Siding, on the Las Vegas and Tonopah Railroad, to the Kunze town site at Greenwater. The time necessary to make the trip is figured at four hours, and the fare will be $35.

Freight and passengers will be transported over a motor bus line between Picture Rocks and Montgomery, two Pennsylvania towns fifteen miles apart.

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Battle of the Fuels

Expert Testimony Concerning the Use of Low Gravity Test Gasoline

BY far the most interesting testimony which has yet come to light in the discussion which rages concerning substitute fuels for internal combustion engines was recently given by Dr. Dvorkovitz, editor of the Petroleum Review, at a special session of representatives of the British automobile industry. This gentlemen, an authority of no mean order, flatly contradicts the popular belief that there is any likelihood, now or in the future, of the market being starved of its supply of gasoline, although he does not deny that circumstances momentarily seem to make it appear that such a theory is warranted. Of equal importance is his statement that if automobile users would abandon the false standard of quality they have arbitrarily set up for gasoline, a distillate of lower specific gravity could be employed without any appreciable disadvantage and with the certainty that there would be an important reduction in cost.

* * *

Gasoline, as all know, is obtained in the process of distilling crude oil to obtain illuminating oil. It is a by-product which it does not pay to produce for its use alone. Its production is largely regulated by the price of illuminating oil and coal. If these be high, liquid fuel in the form of crude oil is in demand, and consequently there is little gasoline distilled. In Pennsylvania, Ohio, Roumania, North Caucasus, and Dutch India (Sumatra), the distillation is regulated by the price of illuminating oil. In Texas, Kansas, California, Indian Territory, Baku, and Borneo, it is regulated by the price of coal. About 60 per cent of the whole world's production of crude oil is obtained from the latter mentioned fields. In the former there is less demand for fuel than for illuminating oil, while in the latter there is more demand for fuel than illuminating oil.

For the time being the whole supply of gasoline comes only from Group 1, the crude oil from which fields contains about 10 or 12 per cent of gasoline. The other fields in Group 2, however, yield an oil containing at least 5 per cent gasoline, but owing to the unscientific method of estimating the quality of gasoline these valuable fields are closed. There is another point of importance. Not only do what may be called the closed fields (closed owing to this unfortunate standard) produce 60 per cent of the world's total supply of crude oil, but they are the very fields which are being more and more developed, whereas the other group of fields are falling relatively behind, inasmuch as investors prefer to put their money rather into fields which supply fuel than into the fields which chiefly supply illuminating oil.

Speaking to the subject of monopoly this witness declared that the only one he was aware of was that caused by the users of gasoline who religiously adhere to a standard that is both artificial and valueless. From experiment he was enabled to assert that the chief guide to selection of gasoline should not be specific gravity, but range of boiling point. Analysis established great differences between boiling points and specific gravities.

* * *

The following highly interesting testimony was given by Dr. Dvorkovitz:

You state that it is impossible to judge of the quality of gasoline which is capable of giving the best results by simply taking its specific gravity.

I base this statement upon the following facts. The various kinds of gasoline at present sold for motor car purposes are a mixture of a number of hydrocarbons. Now, the proportion between the carbon and hydrogen in these various hydrocarbons depends to a certain extent upon the source from which the crude petroleum is obtained, but the ratio of the two varies very little, this being 84.5 per cent. carbon and 15.5 per cent. hydrogen in Pennsylvanian crude oil, and 86 per cent. carbon and 14 per cent. hydrogen in other crudes. Therefore the calorific value of the various benzines obtained from the above crudes must be very close one to another.

Can you give a specific example showing that the specific gravity does not affect the calorific value?

Yes. Let us take Pennsylvanian oil. The lowest liquid hydrocarbon obtained from the Pennsylvanian oil is known as Pentane, which has a specific gravity of 0.628 and a boiling point of 100.4° Fahr., while the highest liquid hydrocarbon of the benzine series is called Octane, having a specific gravity of .703 and a boiling point of 257° Fahr. Here you will notice a very great difference, not only in the specific gravities, but in the boiling points, yet their respective values from a calorific point of view are practically the same, Pentane having 83.4 per cent. carbon and 16.6 per cent. hydrogen, while Octane possesses 84.2 per cent. carbon and 15.8 per cent. hydrogen. The above figures therefore conclusively prove that the specific gravity of any spirit may be a matter of quite secondary importance in deciding the question as to its suitability or otherwise for motors. If, therefore, specific gravity does not play an important part in the question of the utility of certain hydrocarbons for motor purposes, what is, then, the "hall mark" as to the suitability of the spirits? In other words, what is it the motorist has to be assured upon when purchasing fuel for his car?—The chief deciding point, in my opinion—and, in fact, *the* only deciding point which will be found to be thoroughly satisfactory in practice—is the temperature at which vaporisation will take place. Once the motorist knows this, then he can most assuredly depend upon it that his spirit will give complete satisfaction. Let me emphasize my contention. If motor spirit will evaporate entirely in the air without leaving any trace of oil matters, then such spirit should most certainly be considered as satisfactorily answering all the requirements of the motorist, no matter what its specific gravity is. If, therefore, a spirit under ordinary air exposure will entirely evaporate, still more so will it evaporate when drawn in by suction or used under air pressure.

Do you think that all the samples you have shown are equally suitable for use by the motorist?

Yes, with this difference, that the heavier the specific gravity the greater the calorific value per unit volume, and accordingly it requires a slight adjustment in the direction of increasing the air supply in order to ensure complete combustion.

Do you think the motorist will easily make this adjustment?

If he would throw aside prejudice he would find it just as satisfactory to use heavy as light spirit.

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Surely you do not maintain that all spirit supplied is equally good? No; but weight is not the true criterion. The spirit must be pure and free from oily substance. I suggest that purity of spirit can be tested by any motorist by simply pouring a few drops on a piece of white paper, and seeing if it entirely evaporates without leaving any oily traces.

Then purity is independent of specific gravity or weight?

Yes; you may have a pure spirit of specific gravity ranging from .680 to .785, and I believe it would be practically impossible to detect any difference in their use either as regards cleanliness or power produced, except that of the two you would get more work out of the heavier spirit at less cost.

You indicated that standard should be taken by the boiling point. Do you think, having regard to your evidence, that it is really necessary to have a standard at all except that of purity?

My answer to this is that if once you accept the standard of purity, as tested by complete evaporation, you compel the manufacturers to adopt a fixed minimum boiling point. Speaking generally, the question of boiling point is so difficult and complicated, and varies so much with the material produced in each oil-field, that it would be impossible for motorists to adopt this standard, or even understand much about it. I rather referred to the boiling point as the test of the manufacturer and expert, and maintain that if the motorist will only demand purity as judged from the simple test I have suggested, he will secure all he wants.

* * *

It is, of course difficult to say to what extent self interest colors the views of this authority. Nor is it important that we should be informed upon the point, since he but reiterates facts which are well known in circles where gossip and hysterical statements are not given the credence they inspire among the ignorant. The fact is automobile users have been stampeded into believing that the supply of gasoline was seriously threatened, without taking the pains to ascertain if such was really the case. Crafty speculators, disingenuous or dull witted legislators, credulous reporters, sensation-loving newspapers, interests which would be sure to profit by the abatement of governmental rigor, all and sundry with axes to grind made a great outcry, with the result that an act of Congress was passed to legitimize denatured alcohol as a substitute fuel by the removal of the tax on it. Hatters, varnish-makers and a whole troop of miscellaneous manufacturers who don't care a tinker's curse about fuel scarcity or thermal efficiency succeeded in working a pretty trick upon the automobile trade in getting it to pull their chestnuts out of the fire. Their point accomplished, the automobile industry is now left to shift for itself and demonstrate, if it can, that alcohol is commercially available for internal combustion engines.

* * *

Upon this point there is grave difference of opinion. It will be observed upon reference to the statement of Professor Lucke presented in the last number of this paper that though there is no difficulty in using alcohol in carburetters of existing type, yet the consumption for a given power is from one and a quarter to two and a half times greater than gasoline. This means that for a given distance the fuel supply will have to be largely increased. Automobile constructors do not take very kindly to any suggestion which increases weight while offering no corresponding advantages in power. Nor does the average automobile user see how he is to be profited by using a fuel which it is hard to believe can be sold below its cost in Germany, which is 18 cents a gallon if bought in 1,500 gallon lots. The production of alcohol in Germany is very large; larger than it will be in this country for years to come, if the statistics which have been published may be believed. With the consumption in operation doubled, and with the cost almost 40 per cent higher than gasoline can now be bought for in large quantities, the prospect is not a very pleasing one for those who hope to make use of alcohol as a substitute fuel in motor vehicles. Perhaps this gloomy outlook will be changed when our paper-made alcohol distilleries are in operation and our farmers to feed them turn to planting potatoes by the mile.

* * *

The history of alcohol as a motor fuel is confined chiefly to the European continent. More particularly to Germany and France. The French recently organized some automobile trials with alcohol as fuel. At these trials a distance of 453 miles was covered by one car at the rate of 20.85 miles per gallon, while another did it on 24.82 miles per gallon. In Germany there are several experiences on record. In 1902 the German Agricultural Society offered a prize for an efficient alcohol engine. Ten were exhibited, three of which attained an efficiency of from 32.7 to 30.9 per cent. As the gasoline engine is generally taken to give a heat efficiency of about 25 per cent, this gives some support to the claims made for alcohol. Some of these engines had a compression as high as 10 1-4 atmospheres, and the explosion pressure was estimated at 33 atmospheres.

* * *

Coal dust, lycopodium, anything and everything which can be used as an agent for combustion, has been tested and touted as a substitute for gasoline and a running mate for alcohol. It is the ingenuity of the freak minds of the world against the progressive chemistry of the hydrocarbons. Coal dust can be ruled out of court, since it contains too much ash. Lycopodium contains 1.23 per cent ash of a peculiarly silicious and gritty character, and the textbooks tell us that it often contains 3 to 4 per cent of sand! Another trifling circumstance which hinders the free employment of lycopodium is its cost. It is quoted at $1.20 a pound. Doubtless these figures would be reduced if motor vehicle owners united in demand for it. The highly combustible nature of this powder and its safety was early discovered by the theatrical chemical man, who employed it to produce artificial lightning in thunderstorm scenes. Lycopodium contains. besides the ordinary carbo-hydrates of plants in general, some oils which are easily ignited, and it is of extremely low specific gravity. It is a natural growing material which no doubt could be cultivated on a large scale.

But, unfortunately, a pound of lycopodium dust will occupy nearly twice the space of a pound of gasoline. Its weight is 45 when compared with an equal bulk of

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water weighing 100. Then comes the question of carrying the dust from the storage space to the carburetter, but perhaps this would be managed by the use of a "conveyor," or a current of air. But why go on with this farce? Lycopodium is for the mimes and mummers, and for them only.

One of the shrewdest observers of this war of the fuels has delivered himself of this oracular opinion: Given a carburetter which will start cold with cheap petroleum oil, the fuel difficulty disappears. He even ventures to say that the problem is already solved, and only awaits industrial development.

MILITARY MOTOR WAGONS

FRANCE has recently been the scene of another extensive experiment to determine the usefulness of military transport wagons, a distance of 967 miles being traversed, and cash prizes to the value of $3,000 being distributed. The journey was accomplished in a leisurely manner, 16 days being required for its completion.

The military authorities carried out a series of tests in actual service conditions last September with numbers of motor lorries and heavy wagons, but the autumn manoeuvers, however convincing they might be for the special purposes to which the cars were placed, yet did not afford a proof that these heavy vehicles could be relied on to transport material for a thousand miles in regular stages and at given speeds.

Owing to the general satisfaction the motor vehicles have given at the recent meeting from Paris to Marseilles and back, the military authorities have decided to hold another meeting next year, when they hope a larger number of vehicles will enter. It is thought that about three thousand motor transports would be necessary to keep up communications between the railways and seat of war. It was also decided to grant the sum of $4,000 in order to organize regularity and endurance trials for military motor vehicles, which amount will be entered on the war budget.

Awards at the recent trials were made after considering efficiency, regularity, consumption, average speed, accessibility, manipulation, protection of the mechanism against dust and mud. The average speed of the vehicles was 5 miles an hour.

INDUSTRIAL MOTOR VEHICLES IN N. Y. CITY

ACOUNT of the number of industrial motor vehicles operating in New York City, taken at the close of last year, showed that there were 1,117 in active operation. These machines were owned by 133 business concerns. About half of these vehicles were motor cabs; the remainder were employed in transporting merchandise.

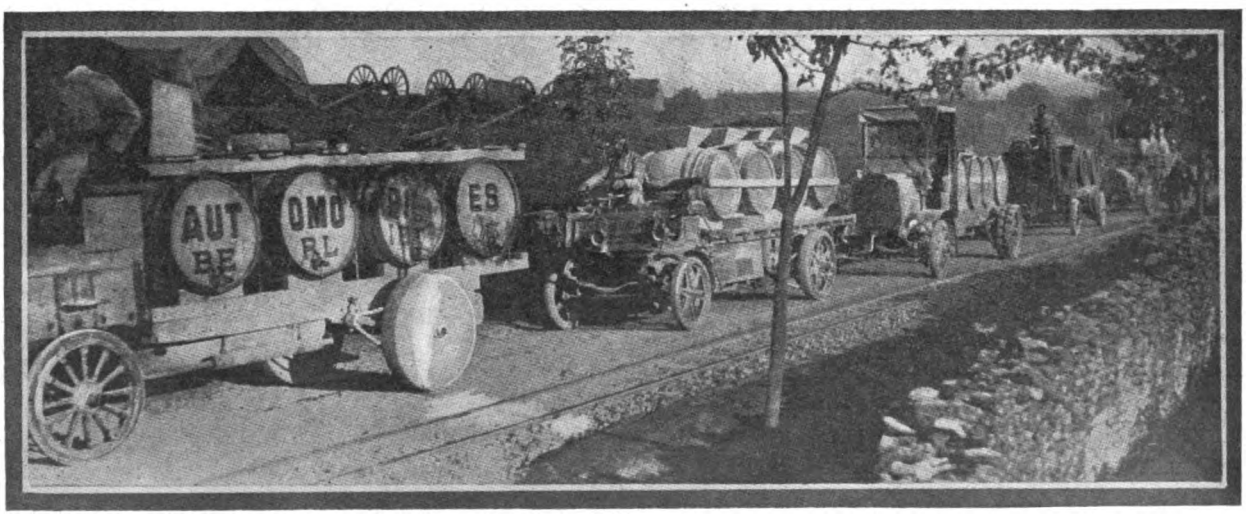
MILWAUKEE'S POSTAL WAGON

ABOUT the middle of this month three steam vehicles will be turned over to the postmaster at Milwaukee for the collection of mail from outlying stations. The vehicles are being built by the Johnson Service Co., of Milwaukee. The body of each wagon will be slightly over 6 feet in length and will be of the customary screen pattern. The engine in each will develop 35 hp.

The fire department of Milwaukee is considering the employment of automobile chemical engines.

The motor buses operating in Paris are quieter than many of the London vehicles. Many of them are fitted with transverse detachable rubber shoes to all road wheels. Judging from the behavior of these buses on greasy wood blocks it would appear that this type of shoe is a safeguard against side-slip.

Capitalists in Los Angeles, Cal., have formed a $200,000 company to operate motor buses between Camp Five, the southern terminus, and Sherwood, the northern terminus of the California Northwestern Railroad. The present connection between these places is by means of old stage coaches. It is planned to start the line with six 60-hp. vehicles, establishing a rapid transit service between Eureka, Humboldt County, Northern California, and San Francisco.



Some of the Motor Vehicles Used by the French Army in the Recent Maneuvers. These Vehicles were Principally Employed in Carrying Water.

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More Show Exhibits

Motor Wagons Seen at the Second of the Big Industrial Fixtures

LIKE the first of the eastern national automobile shows the second, held at Madison Square Garden during the early part of this month, but very imperfectly reflected either the magnitude or importance of the commercial motor road vehicle movement. The lack of room, the unsuitable location of the space so grudgingly provided, and the overwhelming interest manifested alike by exhibitors, visitors and show management in the pleasure vehicle, all inevitably tended to dwarf the merit and promise of the industrial car.

Doubtless vanity and guile prompted the assignment of the most advantageous position in the luxuriously decorated building to the fashionable vehicles which appeal to cultivated extravagance. But was it altogether wise to confine to sub-cellar obscurity the humble machines which are making enduring record for the usefulness and economy of the automobile at a time when there are symptoms of universal protest against its waste? Sooner or later the purely utilitarian character of the automobile will be the solitary attribute by which its worth will be judged. Its novelty is fast wearing off. Its speed and range, once extolled so highly, are now under suspicion. The shrewd sense of the nation demands that the expense attending this whirling invention be justified. Compliance is not easy—unless one summons the experience of the business world as testimony. A motor wagon, a motor bus, a motor fire engine, a motor cab—industrial motor vehicles of whatever kind—safely proclaim their economy and abundantly justify their employment. They earn both their cost and their keep, and for that reason should be suitably staged whenever there is occasion for making a brave display of the automobile industry.

As none of the power wagon parts and equipment makers who exhibited at the first eastern show revealed anything new at the Garden function, it is unnecessary to again review their products. Only the product of exhibitors making complete vehicles, as well as those for the first time showing parts for such, are here described:

* * *

Studebaker Automobile Co., South Bend, Ind.

This firm exhibited nine electric models—a 5-ton stake truck, a 3½-ton stake truck, a 2-ton stake truck, a 2,500 pound express wagon, a 2,500 pound panel wagon, a 1,000 pound panel wagon, a 500 pound panel wagon, a motor ambulance, and a 14 passenger motor bus.

The five-ton truck is fitted with two motors, 89 volts, 35 amperes rating. Battery contains 40 cells. The vehicle will travel 25 miles on one charge over level and hard surfaces with average load, assuming that average load is two-thirds of rated weight capacity. Under the above conditions the maximum speed is six miles per hour. The gauge, measured between centers of tires, is 73 inches; the wheel base is 10 feet, 6 inches. Solid rubber tire dimensions, front and rear, are 36x7 inches. The extreme length of the vehicle, over all, is 17 feet; its extreme width is 92½ inches. Dimensions of clear carrying space, length and width only, are 14½x5½ feet. The dead weight of the truck is 9,700 pounds. The ampere-draw is 70—fourth notch—on level streets with average load of 2-3 rated weight capacity.

The 3½-ton truck is fitted with two motors, each rated at 80 volts, 35 amperes. It is equipped with 40 cell-battery, and travels 30 miles on one charge with average load at seven miles per hour. Its wheel base is 10 feet, 7 inches. Front and rear wheels are fitted with 36x5 inches solid rubber tires. The gauge is 72 inches. The clear carrying dimensions, length and width only, are 12 feet, 4 inches by 5½ feet. The total weight of the vehicle is 8,400 pounds. The ampere-draw on fourth notch over level streets with average load is 70.

The 2-ton truck is fitted with two motors, each rated at 80 volts, 30 amperes. It has a range of 30 miles with average load, and maximum speed of nine miles an hour, so loaded. The guage is 60in.; wheel base, 9 feet, 9 inches; solid rubber tire dimensions, 36x5 inches; clear carrying dimensions, length and width, 11½ feet by 5 feet; total weight, 6,800 pounds; ampere-draw, on level streets with average load, 68 on fourth notch.

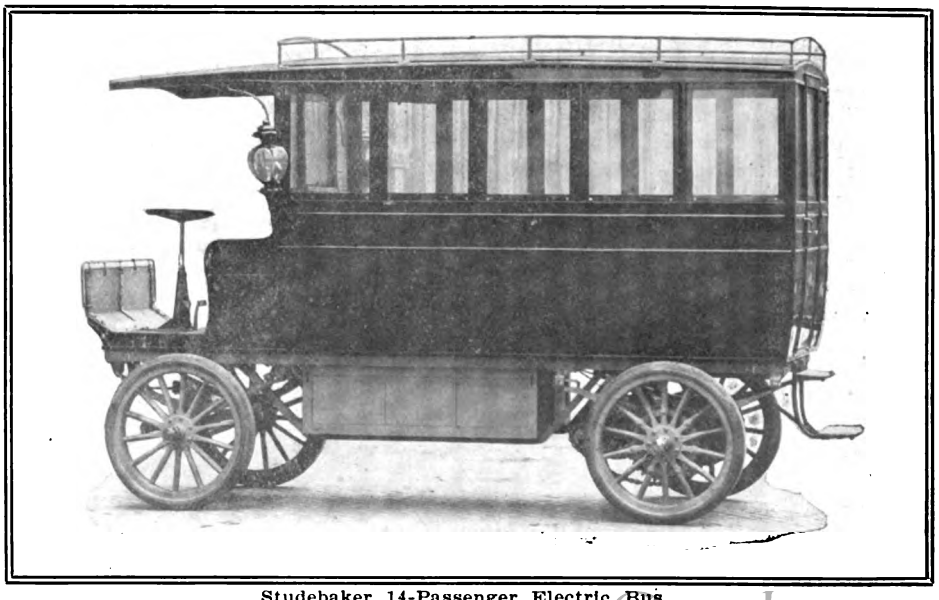
The 2,500 pound express wagon is fitted with motors rated at 80 volts and 20 amperes, has 40 cell-battery, traveling radius of 35 miles with average load and maximum speed of 10 miles an hour. The gauge is 58½ inches; wheel base, 111 inches; solid rubber tire dimensions, 36x4 inches. Total weight of vehicle is 5,800 pounds. Ampere-draw with average load, on level streets, is 45 on fourth notch. Height of floor from ground, 38 inches.

The 2,500 pound panel side delivery wagon is about one foot longer than the express wagon just described. Range, speed, motor equipment, tires, gauge and ampere-draw are alike in both models. Height of floor from ground, 37 inches.

The 1,000 pound panel delivery wagon is fitted with two motors, battery of 40 cells, has a range of 35 miles and a maximum speed of 12 miles an hour with average load. Unlike the models already described, it is steered by side lever, the heavy duty vehicles being wheel steered. Gauge is 56 inches, wheel base, 92 inches; tire sizes, 36x3 inches; total weight, 3,500 pounds; ampere-draw, 32 on fourth notch, with average load. Height of floor from ground, 33 inches.

The 500 panel side delivery wagon is fitted with single motor rated at 50 volts, 30 amperes. It has a range of 30 miles, maximum speed of twelve miles per hour, side lever steering, gauge of 54 inches, solid rubber tire dimensions of 30x2½ inches, total weight of 2,500 pounds and clear carrying space as follows: length of 5 feet 4 inches, width of 32½ inches, and height of 56 inches. Height of floor from ground is 29 inches. Ampere-draw with average load on level streets, is 34.

The ambulance is fitted with two motors and four trays of battery, each containing



Studebaker 14-Passenger Electric Bus.

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twelve cells. It has a range of 40 miles and can be speeded to 15 miles an hour. Its wheel base is 92 inches. Steering is accomplished by means of side lever. The clear carrying space is as follows: length, 7 feet; width, 38 to 42 inches; height 58 inches. Total weight of vehicle is 3,700 pounds. Ampere-draw on level, with load, is 30. Solid tires, measuring 36x3 inches are fitted. The extreme length of the vehicle is 11 feet, 2 inches.

The motor omnibus, fitted with two motors and 40 cell-battery, can travel 35 miles on one charge. Its top speed is ten miles an hour, with average load. Gauge is 58 inches; length of body inside, 110 inches; width of body inside, 50 inches; wheel base, 111 inches; tire diameters, 36x4 inches; total weight, 5,540 pounds; ampere-draw, 45. The vehicle is wheel-steered.

H. H. Franklin Mfg. Co., Syracuse, N. Y.

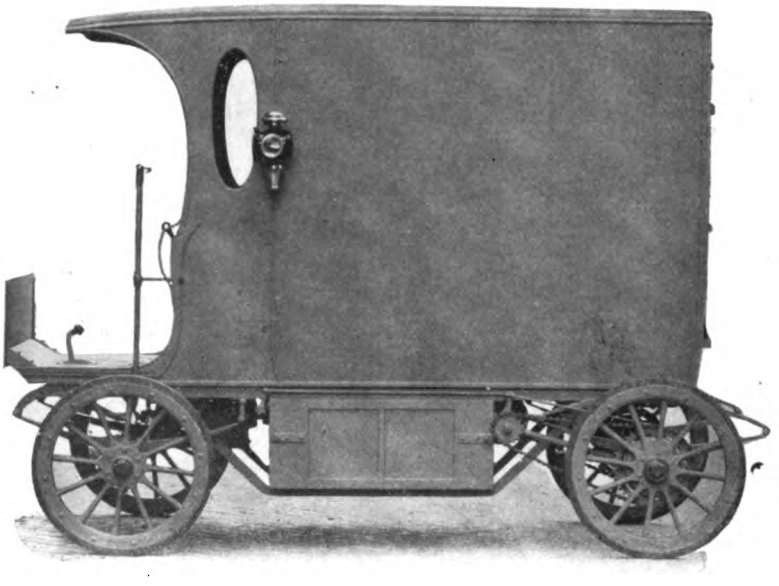
This firm exhibited a one-ton wagon—model J, weighing 2,000 pounds—and a light delivery car with rated load capacity of 1,000 pounds. These vehicles represent the experience of three years experimental work. The motor in each wagon is 12 hp., four-cylinder and air-cooled. The engine of the one-ton wagon is placed longitudially under the toe board and driver's seat, in order to gain room and provide accessibility. On the 1,000 pound wagon it is placed in front of the dash.

The crank shaft of each model is made of special nickel steel, having a tensile strength of 250,000 pounds per square inch.

The intake pipe is of the connectionless type, making it impossible to change the mixture's richness through air leaks. The transmission universal block is designed to prevent wear, practically form a unit of the engine and rear wheels, and compensate any side motion or position variance.

Success in cooling the Franklin engine is largely due to the method of disposing of the hot burnt gases without causing loss of power. This is accomplished by the auxiliary exhausts located at the bottom of each cylinder, and which operates mechanically. This valve is in addition to the regular exhaust valve which is placed in the head of the cylinders. The fly wheel is of the fan type, and through its rapid revolution draws a current of air at a high velocity across the cylinders, thus assisting in the heat removing process. The governor, of the centrifugal type, eliminates all possibility of the engine racing. The oiler is placed at the side of the engine base, being driven through direct gear conection with the cam shaft. The location of the oiler in this position precludes the possibility of non-distribution of oil through broken belts, and solves the problem of keeping the oil liquified at all times. The transmission is of the sliding gear type; gears are made of special steel hardened and so toughened as

Studebaker 5-Ton Electric Truck



Studebaker 500-Pound Electric Delivery Wagon.

Studebaker 2500-Pound Electric Wagon.

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to make the possibility of breaking extremely remote.

The drive of the one-ton wagon is worm-gearing. Bevel gear drive is employed in the light wagon. The clutch is of the disc type, the discs being made of phosphor bronze and steel alternated. The entire clutch operates in a bath of oil, filling the space between the discs when separated and forcing it out gradually as the car is started. This action permits the clutch to slip slightly, giving ease of starting. Jump spark ignition is employed. Two brakes are supplied, one acting on drums at the rear wheels and the other on the transmission shaft. Each machine has two speeds forward and a reverse.

General Vehicle Co., Long Island City

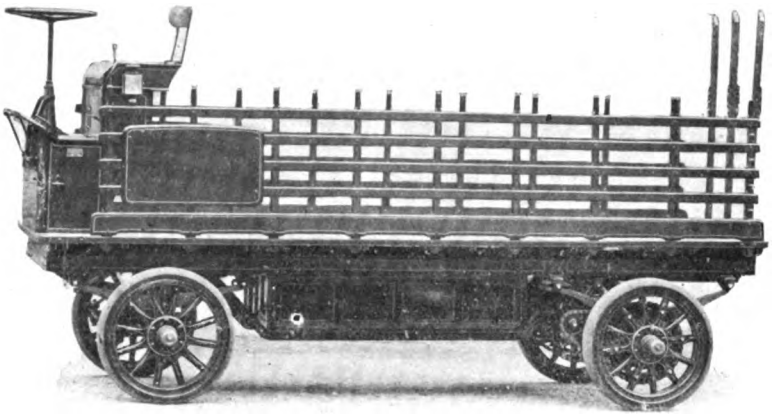
This firm exhibited four electric models —two panel body delivery wagons, a bottling wagon and a brewery truck. One of the delivery wagons has a carrying capacity of 1,000 pounds, wheel base of 87½ inches, floor length of 6 feet, floor width of 3½ feet, 32 inch wheels fitted with 3 inch tires, one motor, 44 cell-battery and is chain-driven. The capacity of the other, also fitted with one motor and 44 cell-battery, is 2,000 pounds. The bottling wagon is fitted with two motors, 44 cell-battery, is chain-driven, has a wheel base of 117 inches, and wheels of 36 inches diameter, fitted with 6 inch tires. Its capacity is 3½-ton or 120 cases. The carrying capacity of the truck is 5 tons or 50 barrels. It is equipped with two motors and 44 cell-battery. Twin 4 inch tires are fitted to rear wheels, which are 36 inches in diameter. Seven inch tires are used on front wheels. Its wheel base is 127 inches. Gauge is 71½ inches.

Knox Automobile Co., Springfield, Mass.

This firm exhibited a 40 hp. chemical fire vehicle as well as a three-ton and one and one-half-ton gasoline trucks. The fire vehicle was similar in all important particulars to that illustrated and described in the November number of this paper.

The three-ton truck has a maximum road speed of ten miles an hour; wheel base of 111inches; 60-inch front wheel tread, and 62-inch rear wheel tread. The front wheels are fitted with four-inch tires, and the rear wheels with six-inch tires. The two-cylinder air-cooled engine develops 20 hp. Planetary transmission is employed giving two speeds forward and a reverse. The drive is by single chain to jack shaft and double chain to rear wheels. The front springs are 40 inches in length and the rear springs 50 inches. The length of the platform, back of the operators seat, is 12 feet, 3 inches. The width of the platform is 52 inches if it does not overhang the wheels.

The one and one-half-ton truck has a maximum road speed of 15 miles per hour with engine speed of 900 revolutions. Wheel base is 100 inches; wheel tread is



Studebaker 2-Ton Electric Truck

Franklin Gasoline One-Ton Wagon

Franklin 1000-Pound Gasoline Wagon.

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56 inches front and 58 inches rear. The front wheels are fitted with 3 1-2 inch tires and the rear with 4-inch tires. The air-cooled engine develops 28 hp. The transmission, drive, brake mechanism, etc., are the same as in the three-ton truck. Back of the operator's seat the platform measures 111 inches. The width of the platform, allowable inside of wheels, is 47 inches.

Waltham Mfg. Co., Waltham, Mass.

This firm exhibited a light delivery car operated by a single-cylinder, air-cooled, four hp. motor. The carrying dimensions of this little vehicle are as follows: Length 60 inches, width 26 1-2 inches, and depth 8 1-2 inches. The load capacity, including the driver, is 600 pounds. The wheels are 26 inches in diameter, with wire spokes and pneumatic tires. The clearance from the ground is 10 ins. The wheel base is 89 ins.; wheel gauge is 42 inches. Five forward and two reverse are supplied, the speeds varying from four to eighteen miles an hour. The weight of the vehicle unloaded is 670 pounds. Power is transmitted from the engine to the rear wheels through frictional discs.

Pope Motor Car Co., Indianapolis, Ind.

This firm exhibited an 800-pound delivery wagon; a 1200-pound delivery wagon; a one-ton truck; a three-ton truck; a five-ton truck, and a twelve-passenger bus—all operated by electric power.

The 800-pound delivery wagon is fitted with a single motor; has a wheel base of 7 feet 1 inch, tread of 4 feet 6 inches, 40 cells of battery, and wheels fitted with 3-inch solid tires. The platform is 4 feet 3 inches in length by 2 feet 10 inches in width. The vehicle is double side chain driven. This model is also built as a closed delivery wagon with carrying space 4 feet 2 inches in height.

The 1200-pound delivery wagon is fitted with single motor and is double side chain driven. Its wheel base is 7 feet 7 inches; tread is 5 feet. It is fitted with 42 cells of battery. Solid 3-inch tires are fitted to all wheels. The platform length is 5 feet 3 inches; width is 3 feet 4 inches.

The one-ton truck is fitted with two motors suspended in front of the rear axle and 42 cells of battery. The wheel base is 7 feet 8 inches; tread is 5 feet 8 inches. Solid 3-inch tires are fitted to all wheels. The platform dimensions are as follows: Length, 11 feet; width, 4 feet 6 inches. The truck is double chain driven.

The three-ton truck is also fitted with two motors hung in front of the rear axle and 42 cells of battery. It is double chain driven. All wheels are fitted with 5-inch solid tires. The wheel base is 9 feet 10 inches, and the tread 6 feet 1 inch. The platform length is 14 feet, and its width 5 feet.

The five-ton truck is fitted with two motors and is double side chain driven It is supplied with 42 cells of battery. All wheels are fitted with 6-inch tires—either solid rubber, wood or steel. The wheel base is 10 feet 1 inch; the tread is 6 feet 4 inches; the platform length is 16 feet and its width 5 feet.

Hewitt Motor Co., New York City

This firm exhibited a five-ton gasoline truck, the weight of which unloaded is about 7,000 pounds. The transmission is of the planetary gear type. The motor, of 30 hp., is an entirely new design, built expressly for truck work. The size of the bearings used throughout are very much larger than those employed in any gasoline engine up to the present time. In the motor thel oads on all the bearings have been calculated so that tey can never exceed those which are satisfactory in the best stationary engine practice. The connecting rods and pistons are very long, giving a low angle of pressure on the pistons in order to secure long wear. The pistons can be removed from the cylinders without dismantling the engine simply by opening doors in the side of the crank case, disconnecting and taking them out. This allows of new rings being put on or new crosshead pins being inserted without a complete overhaul of the car. The cam shaft is in one piece of nickel. steel. The crank shaft is of nickel steel, tempered and drawn, of over 160,000 pounds tensile strength. The water jackets of the cylinders are amply large, and the flat-seated valves are much larger than is usual in automobile practice. Wipe spark ignition in a separate chamber is used, the current being furnished by a Simms-Bosch magneto, as well as by a battery and coil, thus giving double ignition. The spark advance and retard mechanism is all enclosed within the crank case.

The wheel base is 11 1-2 feet; tread is 5 feet, 8 inches; front wheels are fitted with 36 in. x 5 in. tires and rear wheels with 36 in. x 4 in. twin tires. In the center the web of the pressed steed frame is 9 inches deep. The drive is by two chains.

Swinehart Tire and Rubber Co., Akron, O.

This firm exhibited solid rubber clincher tires up to 5 inches in cross diameter. The cross wire system of fastening is employed to keep the tire in position. The sides of the tire are grooved or concave in shape so as to allow the tread to expand over the center of tire when the load of vehicle rests upon it. The depth of this groove or indentation varies inversely with the load to be carried so as to get the proper balance or suspension of load on the tire. The tread is corrugated in such a manner as to get a further resiliency from this source, so that a blow from striking an obstruction in the road first compresses the central bead or corrugation and then distributes the shock to the next two corrugations on either side of it, and in case of a severe shock the force is finally taken up by the central part of the tire which compresses to such an extent as to allow the tread of tire to meet the base. By varying the size of these corrugations and indentations, a nearly perfect balance between load and tire resistance is maintained.

Turner & Fish, Chicago

This firm exhibited wheels made of two sheets of cold rolled steel. The wheel is made to carry loads varying from 15,000 to 50,000 pounds.

Motz Tire & Rubber Co., Akron

This firm exhibited clincher solid tires with cross diameter varying from 2½ to 4½ inches. The characteristic feature of these tires is the method by which they are fastened to the rim. Steel cross wires are placed slantwise in the base of the tire and spaced about one inch apart all the way around. Both ends of the cross wires lock under the inwardly projecting rim of the tire channel. Once properly seated in the rim the tires cannot work loose.

Consolidated Rubber Tire Co., Akron

This firm exhibited the Kelly-Springfield endless solid rubber tire in all sizes. The tire is fastened to the wheel by a flanged and bolted rim. V-shaped steel rings are imbedded in the tire near the wheel band and cause the tire to hug the wheel closely.

Lipman Mfg. Co., Beloit, Wis.

This firm exhibited electrically operated speed indicators, consisting of the combination of an electric generator and a volt meter, which are connected by an insulated copper cable. The generator is driven by one of the front wheels of the car by suitable gearing. The amount of current generated is proportionate to the speed. The insulated copper cable makes an electrical connection with the instrument on the dashboard, which is calibrated to read miles per hour instead of volts.

C. F. Ernst Sons, Buffalo

The ball-bearing turntables exhibited by this firm offer a great convenience in establisments where room must be economized. Three models are made, one for use in buildings where considerable floor depth may be obtained, a second for buildings where small depth is available, and the third for floor use. The first mentioned model consists of a heavy cast iron drum, 24 inches in diameter and 24 inches high, with a hardened steel resistance pin in the center, the pin being surrounded by 3-4 inch steel balls, and the drum surmounted by a cast iron bearing-plate resting on steel balls which bear in grooves cut into drum and bearing-plate so as to resist sidewise motion. The floor construction consists of steel beams and channels, and is furnished ready to receive the floor covering; or, where steel or iron floor is used, the turntable is furnished complete. Where there is comparatively small depth for installing the bearings used are above and below the supporting flange, which gives the required lateral support to the turntable with the least possible depth of drum.

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Oscar Lear Automobile Co.'s 24 hp Gasoline Cab. Weight of Vehicle, 2900 Pounds; Wheel Base 82 Inches, Capacity For Two Passengers.

The Motor Cab

Many Vehicles of This Type Employed in New York, Berlin and London

THE opinion prevails among people who have not looked deeply into the question that motor cabs cannot be profitably employed in cities which do not already sustain an extensive service of horse cabs. As a matter of fact and history the motor cab, like the motor bus, has established its own traffic wherever it has been introduced. To some extent it has drawn from the patronage hitherto accorded horse-drawn vehicles, but the bulk of motor cab revenue is provided by people for whom the use of a speedy and modern vehicle is a necessity during hours of business as well as hours of leisure.

The motor cab is not merely destined to supersede the horse cab, but to acquire a trade of its own which the limited mileage of horse-drawn vehicles forbids them to enjoy.

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Whatever illusions the unthinking masses may cherish upon this subject, the proprietors of horse cabs do not share them. The latter are firmly convinced that if at this moment their investments are not actually threatened with destruction, they are at least undergoing constant impairment, and in the end must be obliterated. The question for them is this: Can present investments be protected while the inevitable change is taking place? The answer will depend upon the courage and foresight of those who have risked their money. The elimination of some time-honored companies from the London bus trade through the introduction of the motor bus should appeal powerfully to concerns similarly situated. Besides, a hasty glance at what is taking place in New York, Paris, Berlin, London and other large cities should be enough to show that this is the hour and age of the public service motor vehicle, big and little. One year from date there will be no horse-drawn buses in London, a city which two and a half years ago gave employment to very nearly 2,500 of these antiquated vehicles. At the end of this year there will be 1,500 motor cabs plying for fare in the streets of Paris; one year ago there were none. New York has over 600 electric public cabs, and the company operating them stands ready at any moment to buy 200 gasoline vehicles to supplement their service. London motor cab companies have orders in hand with English and European manufacturers for almost a thousand vehicles to be delivered within this year. Berlin has about 750 motor cabs in active operation. It is unnecessary to name all cities which have actively taken hold of the motor cab. The list is a long one. Fortunately or unfortunately, as one may view the matter, the establishments at this moment

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which can conveniently spare room, leisure and investment for the manufacture of these vehicles, are not numerous enough to keep pace with the present demand. Renault Freres, who built the first lot of 250 gasoline cabs put upon the streets of Paris, find themselves taxed to the limit of their capacity to supply orders from London and Paris. It will be at least two years before they can catch up with orders. Bayard-Clement have orders in hand for 200. The Darracq company is building 1,100, 800 for London and 300 for Paris. The Panhard-Lavassor company is engaged in similar construction. Some well known English builders have also booked handsome orders.

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One can drive five-eighths of a mile, or a kilometer, in a Renault cab, operated with a two-cylinder 8-10 hp. engine, in Paris for 15 cents. The journey can be prolonged at a cost of 2 cents for every 350 yards. Strenuous efforts have been made during the past six months to introduce these cabs into New York City, but the high ocean transportation and tariff charges have thus far prevented sales. The cost of the Renault cab chassis landed in this country is $2,950. Cab bodies cost about $350 a piece. The whole vehicle is sold in Paris for $1,500. The concerns which the Renault company's agents have approached have wisely concluded that before deliveries could be made from abroad, concerns can be found in this country which would be glad to make cabs in all respects as good as those imported from France at less cost. Home cab companies also balk at purchasing small lots of foreign vehicles which will not be representative of their service by the time American motor cabs are available. To commence gasoline cab service in an American city with any considerable number of vehicles of foreign design, would practically pledge operators to continue using these vehicles, in which event one-half of their investment for rolling stock would have been paid out for ocean transportation charges and import duties, expenditures which have no value in the asset column. There is little likelihood, therefore, that any of the foreign companies which are prepared to make early deliveries of motor cabs can command any trade in this country.

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The eagerness of foreign manufacturers to sell their cabs in this country has led a number of native makers to consider the production of vehicles of this character. The probability that sales will be made in large quantities justifies the expectation that manufacture could be economically accomplished.

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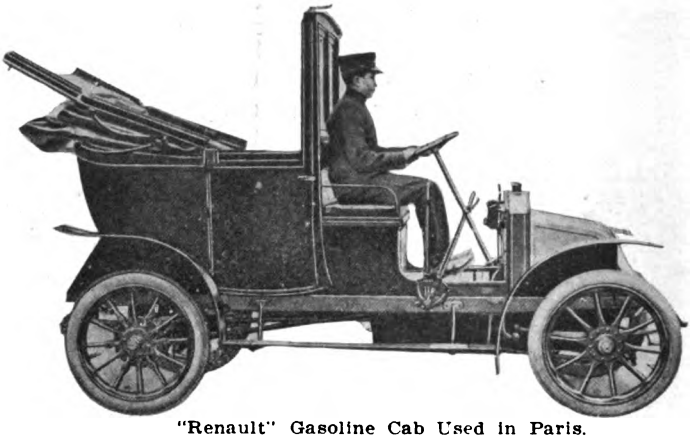
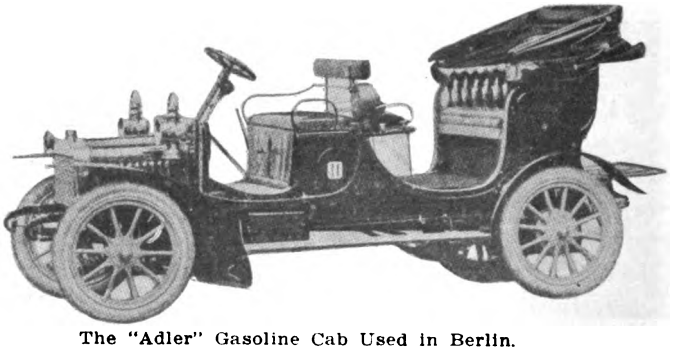
There are 13,000 horse-drawn cabs in Paris. The profit upon their operation is comparatively small; expenses are high, and receipts are at their maximum. Ingenuity can devise no new means by which horse cabs can be made more acceptable to the public or valuable to their operators. The motor cab, on the other hand, has a high earning ability. It has been calculated that one hundred 10 hp. gasoline cabs can be operated in London with a net profit of about $30,000 per annum, after making



"Renault" Gasoline Cab Used in Paris.

"Argyll" Gasoline Cab Used in London.

"Rational" Gasoline Motor Cab Used in London.



The "Adler" Gasoline Cab Used in Berlin.

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Electric "Bedag" Used in Berlin.

Gasoline Tractor Fitted to London Horse Cab.

suitable allowance for depreciation, stabling, insurance, repairs, taxes and executive management. This is equal to about 15 per cent upon the investment provided no company mongering is indulged in. There is plenty of evidence in this country to show that no horse cab company operating upon a similar scale of magnitude pays nearly so well; in fact, the horse cab industry of America is in a state of decline, a fact well proven by the wretched condition of public service vehicles and the utter absence of them in many large cities.

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As the Paris motor cab service is the most modern of its kind, it will be described in advance of the motor cab service in other large cities throughout the world. The rate of fare for one person has already been mentioned. Two people may ride in a motor cab during the daytime at the rate of 15 cents for 825 yards and 2 cents additional for each succeeding 275 yards. The night tariff is as follows: For the first 650 yards, 15 cents, for each succeeding 220 yards, 2 cents. The night tariff is applied between midnight and 6:00 in the morning.

The drivers of Paris motor cabs are paid a percentage of the earnings of their vehicles, which averages about $8.60 a day. Of this sum the driver is paid 15 per cent on earnings below $6; 20 per cent on earnings from $6 to $8; 25 per cent on earnings from $8 to $10, and 30 per cent on earnings above $10. On an average the driver earns from $70 to $95 a month, exclusive of tips, which are universally given, and a small profit on gasoline which he is compelled to purchase for the operation of his machine. Each driver is allowed 15 per cent of his total earnings for the purchase of gasoline, which is supplied to him at wholesale rates.

The cost of maintaining tires is calculated at 2 cents per kilometer (five-eighths of a mile). Cabs average about 80 miles per day. Depreciation is reckoned on a basis of three years, with three hundred running days in the year. The cost of each cab is $1,500. The net profit to the proprietor, after all charges are made, amounts to about $1 per cab per day.

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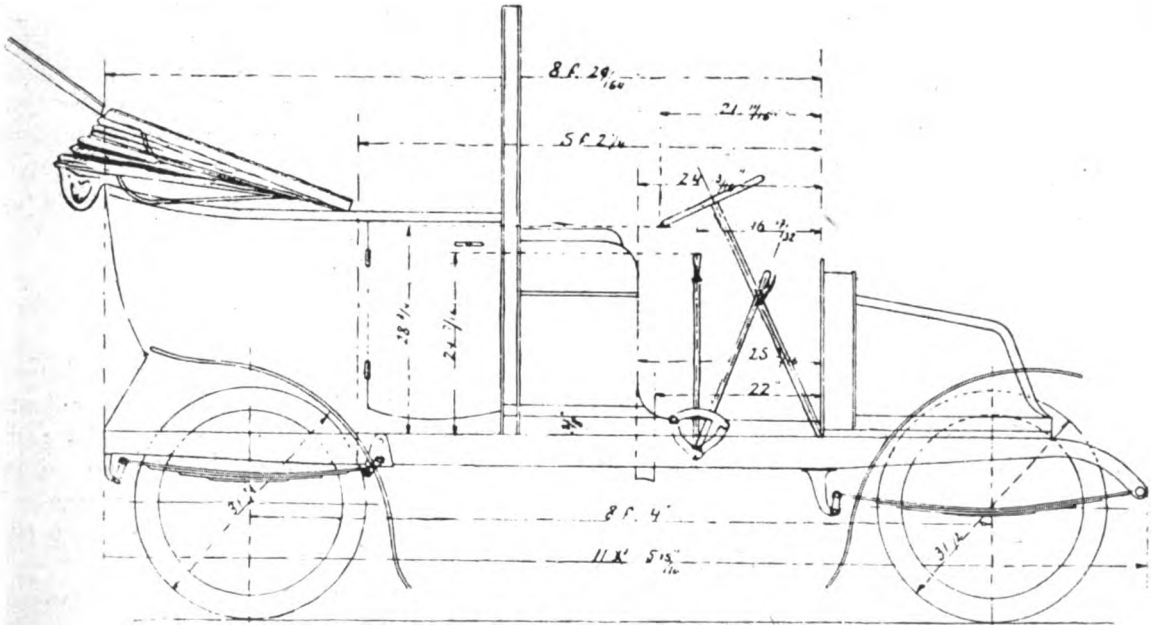
The Renault cab, which is most numerous in Paris, is painted a brown red. It is open in summer, with a glass screen in front which forms the weather support for a black hood used in bad weather. It is known as a landaulette. The frame is made of pressed steel formed of two side bars and three cross braces. The chassis is 11 1-2



Elevation Drawing of Renault Cab.

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feet in length, with a width of 32 inches. Five springs support the chassis on the axles, one of these being placed transversely on the rear side springs. The two engine cylinders placed side by side have 3 inches bore and 4 3-4 stroke. Three forward speeds are provided. The speeds are geared for 5, 9 and 22 miles per hour. Each cab carries a reservoir holding 28 liters of gasoline, more than necessary for the daily needs. Some fifty Renault four-cylinder 14 hp. cabs have also been ordered, which will be on hire for daily excursions or special services. When the cab is idle and the weather is severe the motor is kept turning over slowly. The water circulation is by thermo-syphon. Slight repairs, such as the changing of a tire or the improvement of ignition, are attended to by the drivers.

* * *

For three years past motor cabs of one kind and another have been familiar sights to the people of Berlin. At a census taken last July it was ascertained that 439 of these public service vehicles were in active operation, of which 89 were operated by electric power, and 350 by alcohol or gasoline engines. All belong to one concern—The Berliner Electromobile Droschken-Aktien Gesellschaft. For convenience the vehicles are known as "Bedags," a term derived from the initials of the firm. The vehicles are chocoate colored and are popular with the public. The operating company's garage is at present of temporary character, pending the construction of a permanent and spacious station in one of the suburbs.

Since the census referred to the number of electric machines in operation has risen to 250, while considerable additions have been made to the gasoline cabs, the total number now in use being estimated at 800. Some of the gasoline cabs are friction wheel driven. A few are powered as high as 14 hp. and contain four cylinder engines. The majority, however, have two cylinder engines and are rated from 6 to 8 hp. The types of gasoline cabs used in Berlin are as follows: Maurer, Adler, Durkopp, Daimler, Panhard-Lavassor, Clement, Protos, Dixi and Argus. Many cab companies have been formed, half a dozen possessing a capital of $125,000. Like the Paris cabs nearly all the Berlin vehicles are fitted with taximeters.

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Although there are fewer motor cabs operating in the streets of London than in any of the other large cities, yet it is absolutely certain that before the close of the present year the number in service will be very large. One company organized for the operation of public motor vehicles has placed an order for 500 for delivery within the next six months, while many companies will begin business with smaller installations. In the middle of last summer there were not more than forty motor cabs operating in London. The principal operating companies are the London Motor Cab Company, the Automobile Cab Company, the Metropolitan Motor Cab & Carriage Company, the City & Suburban Motor Cab Company and the General Motor Cab Company, which latter concern is the one which has contracted for 500 Renault vehicles. The Automobile Cab Company has placed an order for 40 French cabs, and the City & Suburban Company an order for 26 more from the same source.

At the present moment the Metropolitan Motor Cab & Carriage Company has the greatest number of vehicles. Its cab is known as the "Herald," a 12 hp. two cylinder gasoline vehicle. The drivers employed by this company are paid a weekly wage on the basis of $1.20 per day, in addition to which they receive a commission of 10 per cent of the gross sum taken in as fares. The earnings of the cabs vary acording to the weather, running from $8.50 to $15 per day. The high earnings of these cabs is due largely to the favorable location of the "ranks" at which they are to be found. Motor cabs are conspicuous at Hyde Park Corner and in Trafalgar Square opposite the National Museum. The rules regulating the terms of payment and general conduct of the company's drivers are herewith presented:

1.—The standing rate of payment to drivers will be at the rate of $7.20 per week of six days, or $1.20 per day for every day that the cab shall have been taken out from the garage by the specified time in the morning as stated below (or at any special time for which it may have been ordered).

2.—In addition to the above mentioned standing wage of $1.20 per day the drivers shall be entitled to receive a commission of 10 per cent upon the total amount paid in by them; and where the vehicle is privately hired, then to 10 per cent upon whatever the company may be charging for the vehicle.

3.—All drivers must be at the garage by 9 o'clock in the morning, and must leave the garage with their cabs not later than 10 o'clock unless their cabs have been specially ordered for another time. Between 9 o'clock and time of going out they are expected to ascertain if everything necessary has been done to their vehicles. With regard to the time of returning to the garage at night, when many motor vehicles are on the rank at 9:30 p. m., it is recommended that most of them should return to the garage. But as the time of return is largely at the discretion of the drivers it must not affect the time of arriving at and leaving the garage in the morning.

4.—Any cab which is in running order and which has not left the garage at 10 a. m. will be handed over to the reserve driver first on the list, and the original driver who should have taken out the cab will lose his wages for that day.

5.—During the time when any cab may be laid up for repairs or otherwise, the driver will receive wages at the rate of $6 per week of seven days, during which time he must observe the time for arrival at the garage as if his cab were in order and must make himself useful to the company in any way in which he may be directed.

6.—Any fault or defect in any cab must be reported at the garage on returning at night by writing down the

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particulars and handing same to the man in charge.

7.—The regular allowance of gasoline daily to all cabs will be four gallons; two gallons into the tank and a spare two gallons in a can in exchange for an empty can. Cabs specially engaged for long journeys will be supplied with the necessary quantity of gasoline.

8.—Drivers will be held responsible for all tools, spares, lamps, clothing and accessories supplied them by the company, and in the event of any loss or damage to any of them, reasonable wear and tear excepted, the drivers will be required to make good the same.

9.—In the event of the company's wishing to dismiss a driver, or driver's wishing to terminate his engagement with the company, one week's notice on either side shall be given, but such notice may be given on any day and take effect on seven days from that date.

The charges for hiring motor cabs by the hour are as follows: First hour, $1.80; for each subsequent half hour 80 cents. The charge for a whole day's use of a motor cab is $10. The charge from 7 p. m. to midnight, $6. A day in the country in a motor cab costs $17.50. Its use for a week in the city costs $65. Its use for a month costs $200. It is interesting to note that while one may hire a motor cab in London for 60 cents per hour, the driver cannot be compelled to drive faster than four miles an hour, or to take the "fare" for more than one hour. Those who desire to proceed at a faster rate of travel must pay the full motor cab rate of $1.80 per hour.

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The principal qualifications for a London motor cabman are that he shall have acquired a reasonable proficiency in the handling of his vehicle and have a knowledge of the city and surroundings. For this latter reason cab companies give preference to horse cab drivers. London, as a cabman must know it, is familiar only to cabmen. Many are familiar with two or three districts of the great metropolis, but it is only Jehu who knows the names and locations of the little byways and alleys, many of which are of considerable commercial importance. Fifty per cent of the motor cabmen in London are total abstainers from drink, and all are under personal pledge to the managers of the operating cab companies not to taste liquor while driving their machines.

One of the chief drawbacks to the money-earning capacity of the London motor cab is the difficulty in distinguishing it from motor vehicles operating for pleasure. One of the cab companies, to mark the difference between the two types of vehicles, has placed in the side lamps a green glass with a white letter in the center, which affords the public a ready means for identifying vehicles for hire.

The "Rational" cabs operated by the London Motor Cab Company are driven by a two-cylinder horizontal engine giving 12 hp. The drive is through crypto and epicyclic gear to the live axle. These vehicles are fitted with solid rubber tires on all four wheels. The "Argyll" is one of the few strictly British-made motor cabs plying for fare in Great Britain. This cab, which seats four people, recently made a trip from Glasgow to London carrying five pasengers and 3,700 pounds of baggage, making an average speed of 18 miles an hour on the road. The vehicle has a wheel base of 78 inches; track of 52 inches. Wheels are 32 inches in diameter. The engine, of the four cylinder variety, develops 16 hp. The cab is painted dark green with a panel of Argyll tartan, giving the vehicle a very distinctive appearance.

Some time ago a parliamentary committee was appointed to investigate the subject of London cabs and omnibuses, both horse-drawn and motor-driven. The inquiry, like all others of its kind, was more ceremonious than useful, nothing noteworthy being developed except the suggestion that a fare of 16 cents per mile be charged for motor cabs as opposed to 12 cents a mile for horse-drawn cabs.

MOTOR MAIL WAGONS APPROVED

OFFICIAL approval of the motor mail wagon has been given in the annual mreport of the first-assistant postmaster general, which has just been made public.

In the document it is stated that the use of motor wagons in the mail service of Baltimore has proved so satisfactory that the postal department is now planning to extend similar facilities to other large cities. The report says:

"It is believed that in large cities automobiles can be advantageously substituted to a considerable extent for the horse carts now employed so generally in collecting mail. By the use of automobile, a much speedier collection service can be organized without added expense. Plans are being considered also for the introduction of the automobiles in other branches of city postal system, with the purpose of quickening as far as possible the handling of the mails. Unquestionably, the motor vehicle can be made an important factor in the postal service, as it already is in other business enterprises."

Motor bus service is now afforded between the union depot in Alliance, Ohio, and Mount Union. Half-hour trips are made, with stops at each intersection along the main thoroughfare. Motor truck service will probably be inaugurated within a short time.

There is talk in England of putting a heavy duty on imported commercial motor vehicles.

In Calcutta, India, a company has been formed with a capital of $400,000 to operate ten motor buses and ten motor wagons in public service.

Six motor buses will soon be operating in Evansville, Ind.

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Shock Absorbers

Eminent Engineer Urges Their Use With Springs Designed for Maximum Loads

HABIT has accustomed motor wagon users to regard the spring suspension which is adequate for full loads as entirely suitable for partial or light loads. Engineers, however, are but too well aware that the resistance of metallic springs to flexion, being calculated to maximum load, is lessened as the load is lightened, which is the scientific way of saying that frame shocks are most severe and frequent when springs are so stiff as to prevent their beneficent action being called into play.

It has been shrewdly remarked by one of the most eminent authorities on springs, the French engineer Lemoine, that in the case of power wagons the chief consideration is the transportable load, the speed of the vehicle being more or less a secondary consideration. The load varying frequently and considerably, it is quite necessary that the vehicle should run as satisfactorily loaded as light. But the vehicle travels more often light, or with a partial load, than fully loaded, and hence it is necessary to re-inforce the spring suspension system with some device which will aid it in absorbing shocks. In adapting supplementary shock absorbers to motor wagons, however, the resistance of such apparatus to spring flexion must diminish with the load in such a way that it exerts maximum effect with maximum load.

It will be interesting to follow Lemoine in his well-reasoned effort to prove the comparative worthlessness of a spring suspension system which only performs its duties when maximum loads are being hauled. He says:

Resistance to variable flexion can be introduced by the use of a compressible fluid, the variations of whose volume may determine the variations of pressure due to the load acting upon the suspensory system.

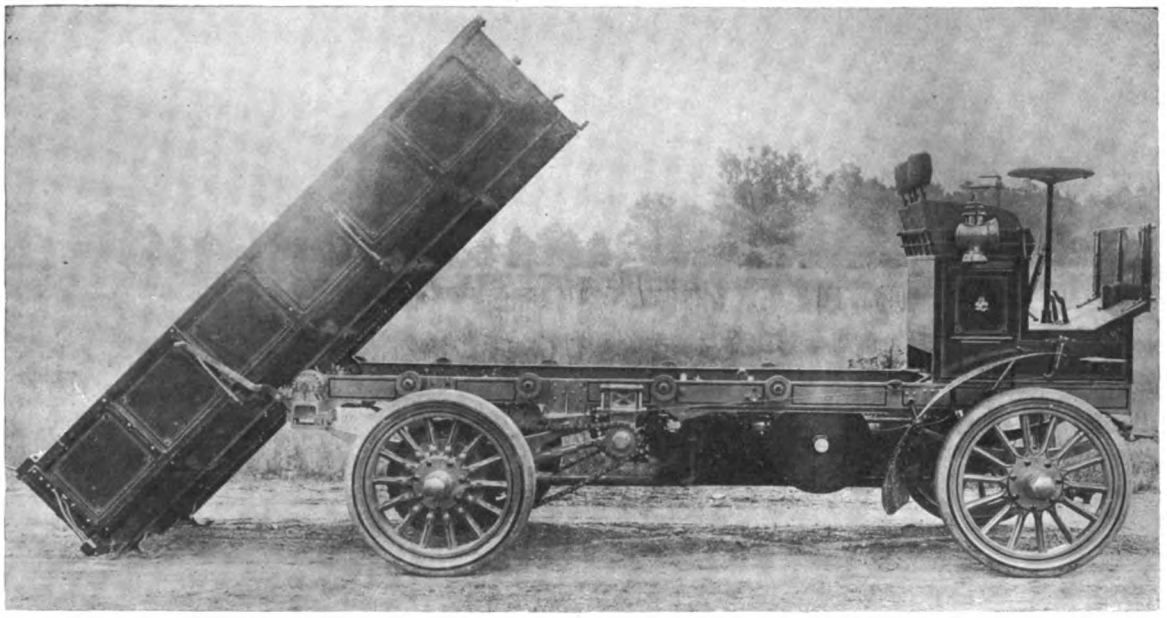
Devices which fully comply with the above conditions may be regarded as true suspension regulators, because in operation with springs of little flexibility they only permit slight reactionary effects to reach the frame, the resistance to flexion being reduced in proportion to the reduction of load.

By the above reasoning, it will easily be perceived that considerable advantage is to be gained by combining the suspensory systems of industrial motor vehicles with suitable shock-absorbers which shall always reduce to the uttermost, with either light or full loads, the shocks which, due to bad roads, must reach the frame. When the suspensory system is always proportionate in its effect to the load, shocks arising from the reaction of the springs will be entirely nullified.

Therefore a complete and carefully considered suspensory system for industrial vehicles should consist of metallic springs proportioned to the maximum load, and shock-absorbers acting in every case, but particularly in the case of light loads, in such a way as to regulate the flexion of the suspension members and result in equal effects upon the frame, whether the vehicle be loaded or light.

The best results are obtainable with shock-absorbers which automatically vary resistance to flexion in such a way that the resistance is always proportionate to the load, which may at any time occur within the limits for which the vehicle is constructed.

The economy of practical shock absorbers is self evident. Their use tends to reduce the cost of tire upkeep and to minimize repairs due to vibration. They make high speeds permissable and safe upon empty return trips, an advantage which is denied by the single employment of springs which are only suited for maximum loads.



Tipping Sand Wagon

THIS body is mounted on the chassis by six rolls on each side attached rigidly to chassis. These rolls are grooved. In the groove runs a steel track which is secured to the sills on the body. A crank and compound gear operate a rack and pinion in the center of the body, carrying the body back until the center of gravity of body and load is over the extreme end of the frame, when the least upward tilt of the front end of the body will cause it to dump. The air cooled engine has two-cylinders, dimensions 5 in. x 7 in. developing 16-20 h. p. Wheel base is 111 in. This wagon is the product of the Knox Automobile Co., Springfield, Mass.

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Non-Skidding Devices

Their Use is Made Imperative Wherever Streets Are Imperfectly Cleaned

NON-SKIDDING devices which in operating abroad the street surface do not appeal to the authorities which exercise control over city traffic. Many inventions of this order have been offered to the users of heavy motor vehicles, but, for the reason stated, are unavailable wherever the traffic supervision is vigilantly conducted.

The whole question of side-slip would not deserve nearly so much attention as it receives if city officials could only be induced to see in clean streets any other advantages than those of public health and sightliness. The impairment to vehicles which is caused by slipping on slimy thoroughfares may seem trifling to municipal administrators, but if they had to foot the expense which such impairment represents, they would be astonished at its magnitude. The art of street cleaning will make little progress so long as horses are generally employed in hauling merchandise. Flushing with water is an imperfect remedy. It cannot and does not remove slime or grease. Brooming and washing is better, but slower and more expensive.

It is a little singular that city officers who will not countenance road-scraping non-skidding devices on heavy motor vehicles should tolerate the calking of horseshoes and the use of thin iron tires on horse-drawn vehicles. The pounding of thousands of hoofs on our city streets gives no offense to these discriminating functionaries. To be legalized mischief must be venerable from age.

In some parts of the world, however, such nice scruples are not entertained, and any form of non-skidding device which does not deeply scar the road surface is permitted as equipment on heavy motor vehicles. Where such catholic tolerance is in fashion the device shown in Fig. 1 has operated satisfactorily. The skid preventive is normally out of action except when the vehicle manifests a tendency to slip sidewise. A stud or plate, A, is held by the parallel links B and pins C to the stud or plate D, which may either form the head of a bolt E fixed in the felloe F of the wheel, or may be held in position in them space between the twin tires by a steel band passed round the felloe. The studs are located at close intervals round the circumference in the

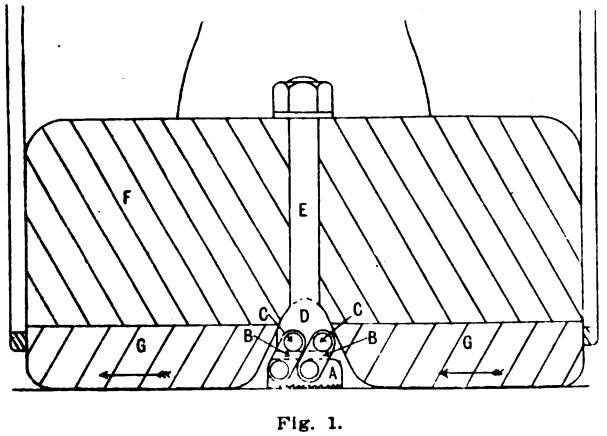

Fig. 1.

space between the two tires. The length of the links B, it will be seen, is such that when the stud or plate A is resting upon the ground the links are inclined to the vertical, so that upward pressure upon A merely raises it without producing any lifting effect upon the wheel; but immediately the tires move in the direction shown by the arrow, the stud or plate A, by reason of its roughness not sliding with the tire, is at once pressed into contact with the road surface by the motion produced in the

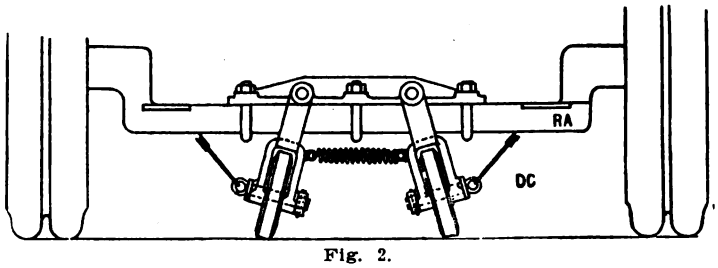

Fig. 2.

parallel links B, and skidding is prevented. The links B may be fixed to incline in either direction to stop skidding to either side.

Fig. 2, shows an auxiliary two-wheeled trailer attached to the rear wheel. The wheels are operated by a chain connected to the driver's seat, being pressed against the road surface by the action of an intervening spring.

One of the most recent devices of this order consists of a light two-wheeled trailer placed under the body of the vehicle, just back of the rear axle, and connected to the body of the vehicle by means of a ball and socket joint. This trolley runs on ordinary mail cart wheels. In front of each of the driving wheels a sand box is arranged, with a pipe leading to the wheel tread. A connection is made with the trolley by means of wire

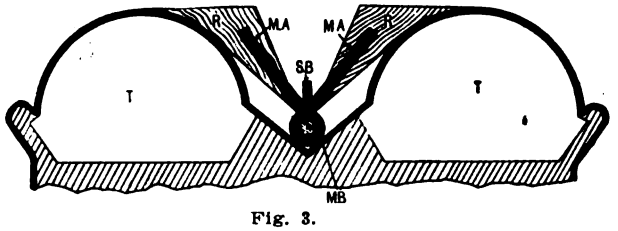

Fig. 3.

attachment. The device works in the following manner: When the vehicle commences to skid a lateral strain is put on the wheels of the trolley, thereby opening a valve on the sand box, allowing a sufficient quantity of sand to fall through on to the roadway. As soon as the skid is overcome, and the vehicle resumes its normal course, the valve closes and prevents the further issue of sand. It will be seen, therefore, that the whole action is automatic.

Fig. 3 is a device constructed on the principle of the ratchet pawl, only the pawl is applied to the road instead of to the ratchet teeth. Between the twin tires a metal hoop is fitted around the wheel, and upon this arms covered with rubber, and free to swing on the pivot-

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ing hoop, are placed. As soon as the road wheel evinces a tendency to go sideways the edge of the rubber flap (on that side of the wheel towards which the slip occurs) is stroked upwards and raised. The arm is thus brought with its edge (or rather the edge of the rubber which encases it) "digging" hard into the ground, and the greater the tendency to side-slip the greater the pressure with which the arms dig in and prevent such movement.

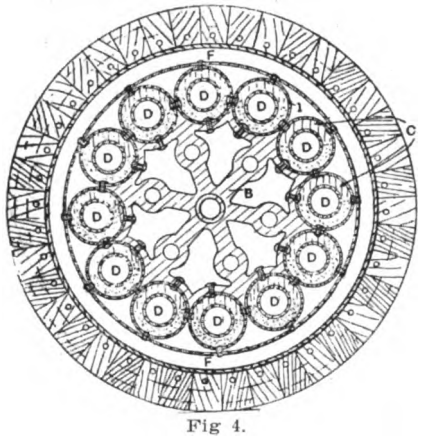
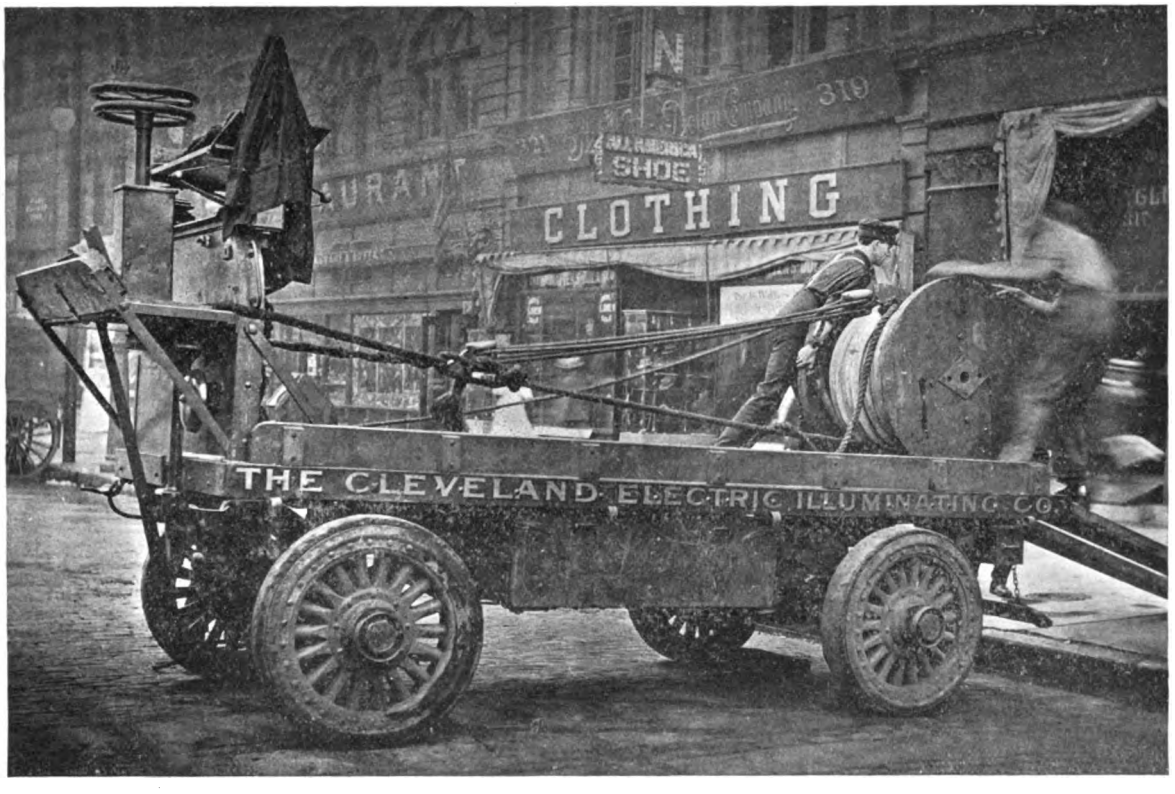


Fig 4.

Fig. 4 is a rather complicated rear wheel device, which has the merit of utilizing wood tires. It has been tested with some degree of satisfaction on seven-ton vehicles. Each rear wheel is provided with a central spider or hub so shaped as to accommodate twelve circular casings in each of which are rubber saddles, C, fitted on an iron tubular horse, D. The horses are connected with the outer rim, while the casings over the rubber saddles are secured to the spider. Thus that part of the weight transmitted through the hub is taken by the tops of all the casings pressing on the tops of all the rubber saddles, which in turn transmit the stress of the weight through the horses to the rim. As the wheels are shod with tires made of wooden blocks placed with the grain "end on," and constantly and rapidly varying stresses tend to be transmitted to the vehicle through inequalities of the road surface, something is required to damp down the shock. This absorption of shock is obtained by the fact that all stresses from the rim to the axle, or *vice versa,* have to pass through the rubbers C, and the necessary room for play between the rim and the center of the wheel is allowed for by the space F. The driving stresses are also insulated from shock.

Motor freight and passenger service was recently established between Pueblo, Colo., and Chicosa, Hastings, Tobasco, Berwind, Suffield and Bowen, camps in the mining county, are improvements made during the year. One round trip is made daily.



Illuminating Company's Six-Ton Truck

THE Cleveland Electric Illuminating Company employs a six-ton electric truck for pulling heavy cables and wire through underground conduits as well as in hauling materials from its warehouse and depots to various parts of the city where its service may be required. It has replaced the service of two two-horse wagons. The company's warehouse is located in the section of the city known as the "flats" and it is necessary to climb 7 to 9 per cent. grades on every trip. For this reason the motors of the truck were given an especially large overload capacity. The truck is fitted with two 3½ hp. Elwell-Parker motors, which are capable of an overload of 400 per cent. for short periods. The Willard storage battery, with which the truck is supplied, at a load of 20,000 pounds at 8 miles an hour on paved streets, show a discharge of 55 amperes at 80 volts. The motor drive by chains to the rear wheels. The motor shafts are mounted on ball bearings. The wheels are on roller bearings. The wheels are 36 inches in diameter and are fitted with 7 inch solid tires. The vehicle is mounted on a heavy channel iron frame. It has a platform 5½ feet wide by 15 feet long.

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TRACKLESS TROLLEY WAGONS

THE trackless trolley wagon is so nearly akin to the power wagon as to provoke considerable curiosity concerning its usefulness in the field of mechanical road transport. A test of its commercial availability is now being made in Pittsburg by the local street railway company, the single trolley wire of the company and its tracks being used instead of the double wire and trackless road usual in the operation of this system. Speaking of the experiment the president of the Pittsburg street railway company says:

"When I visited the works of the trackless trolley wagon makers I said it would be necessary for me to see the wagon go up Wylie avenue, turn into a side street on its storage system, deliver its load of freight, return to Wylie avenue or some other trolley line and come down the hill before I would venture an opinion. However, I was satisfied with the operations of the system at Philadelphia. It worked well on a small truck that is to be tested in Pittsburg. Passenger wagons were also operated with success. We have made a tentative agreement with the company for the experiment, and should it prove a success, a permanent agreement will likely be made. The cars are to operate from Pittsburg to any part of the city that our lines go. The trolley wagon will have a light bamboo pole with a regular trolley wheel for getting power from the line, while a small set of track wheels will connect with the track for the continuous current. These wheels and the trolley pole are flexible and can be changed in an instant, so that the storage battery will operate and thus allow the wagon to turn from the racks like an ordinary automobile."

The foundation of the system is four driving units, a motor attached to each wheel forming an independent unit of power. Power for operating one of the wagons is estimated at a cost of 1 1-2 cents a car mile.

Trackless trolley lines are not uncommon in Germany and France. Their use is confined more particularly, however, to places where the initial cost of track building is more than is warranted by the revenues. On some of these lines trailers are used.

In fitting tension rings to wheels equipped with solid tires some foreign users of heavy motor vehicles prefer to put the detachable flange on the inside of the wheel, towards the body of the vehicle. This is to guard against breakage of the tension ring, in case of side-slip or collision, but it has the disadvantage, in the event of its working loose, of allowing the ring to go between the sprocket and the chain, when the chain or the differential casing may be broken, and the sprocket shaft bent.

The consolidation of two large commercial motor vehicle producing plants in England has been announced —the Argyll and Scott-Sterling works. The capital stock of the new company will be $750,000.

LIQUID AIR AS A MOTOR FUEL

YEARS ago the imagination of automobile users was excited by the cleverly heralded possibilities of liquid air as a source of motive energy. Its high cost of production, the danger attending its manufacture, and the disproportion of dead weight to stored usefulness, caused its eclipse. Its cost is now said to have been reduced to one-sixth of the price originally estimated, or about two cents a gallon, an announcement which naturally revives interest in its employment as a motor fuel.

The process by which this economy is achieved consists of first purifying atmospheric air and then compressing it by stages to 2,500 pounds to the square inch. It is finally reduced to 125 pounds to the square inch, which then cools and liquefies the high-pressure air.

Automobile owners are not enthusiastic about liquid air. They see that each horse-power hour would want at least 30 pounds of liquid air. A 10 hp. car, therefore, would require for a 10-hour run, 3,000 pounds of liquid air to drive the engine. But it is impossible to keep this material without a quantity constantly boiling away; so that it would be necessary to begin the run with a supply about half as great again as is theoretically required—say 4,500 pounds—two tons of the motive liquid, at a cost of about $537. The tank to store this must have a capacity of 72 cubic feet; and as a thick insulation of at least six inches would be required to check the boiling off as much as possible, the external dimensions of the tank to be mounted on the automobile would be 7 feet by 5 feet by 4 feet. Perhaps, however, the design provides for putting it on a tender coupled on behind.

It is remarkable what optimism has characterized the proceedings of liquid-air companies in the past, and enabled them to build and maintain the highest hopes on an unbroken succession of disappointments and mistakes.

MOTOR WAGONS IN INDIA

ADVICES from India state that motor wagon service for agricultural purposes will soon be supplied between Mysore and Coorg, in the province of Madras. The carriage of the mails will, it is stated, be also included. A government order has been issued advising the native land holders to export their oranges by motor wagon, and promising that arrangements will be made to carry the fruits so that they will not touch one another. It has been customary to arrange for haulage of the orange crops for periods up to five years.

Even Montana has its motor bus line, service connecting Dillon and Virginia City and passengers being carried on the eleven hour journey at the rate of 10 cents a mile.

Independent unit motor rail service has been started in twenty-five districts in France.

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Wagon Maintenance

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

AN engine will sometimes develop blowing or whistling noises, which may be due to various causes. They may be due to the compression tap having jolted open, in which case the note is shrill, resembling whistling, and is accompanied by loss of power. If the noise resembles a sharp crack, it is due to some leakage of the exhaust system, either owing to one of the nuts, or unions of the exhaust system, having slacked off. A further noise, in which the blowing is nothing like so shrill or loud as in the previous cases, is due to the crank chamber waste oil tap having accidentally opened or dropped out. In the first two cases, no harm can really be done by continuing the journey, but in the latter case the engine should be immediately stopped, and the trouble remedied. If the tap is lost, a plug of wood can be driven into it, or in many cases a bolt can be found with a similar thread. Care must be taken not to screw the bolt too far into the crank chamber, or it may be struck by the connecting rod. As most of the oil has been lost out of the gear box, it will be necessary to replenish the supply in order to prevent any danger.

Idle Ignition Batteries

When an ignition accumulator has been standing idle for any length of time it is not safe to assume that it will work in a reliable manner. The voltage may appear to be fairly high after a rest, and yet immediately a small amount of current is required from it the voltage drops down and is insufficient to work an ordinary ignition coil. With such a battery the engine will start up readily enough, and will run for twenty seconds or so; then the engine speed will gradually decrease, and ultimately the engine will stop. After a few moments' rest the engine can be again started, with similar results. The novice is rather inclined to think that this shows that the battery is in good working condition, and that the trouble lies with the gasoline supply. The symptoms, however, are different, for with an insufficient gasoline supply, in addition to slowing up and stopping of the motor, there is also always a back firing in the carburretter. The best way to keep accumulators which are not used regularly is to freshen them about once a fortnight by connecting to a charging dynamo. When so treated, very little charging current is required, and the batteries can always be relied upon for use when required.

Wagon Inclinations and Fuel Supply

With certain types of float feed carburetters the level of fuel in the jet alters with the inclination of the wagon. This is most noticeable in the model in which the jet is placed forward of the float chamber and in the axial line of the vehicle. The immediate result is, of course, that when ascending grades greater suction is required to lift the same amount of fuel than is used on the level, and except in the case of an exceptionally well designed apparatus a starved mixture is apt to result. Probably on this account, to a great extent, many wagons prove to be extremely sensitive to grades, the effect being, of course, heightened where the fuel is drawn from a tank by gravity alone. In a similar way, the choking and sputtering which many motors give vent to when throttled on descending grades may be due to a rich mixture produced by overflowing.

Lengthening a Valve Stem

In course of time a valve stem that has been long in commission will shorten, owing to the hammering action against its lower end. This shortening means incorrect opening and closing of the valve, both as regards the instant at which these take place and the lift. If the valve is an exhaust valve, loss of power ensues, and the symptoms of overheating are set up. The proper cause is frequently overlooked, and much time is spent examining the pump and water circulation. The valve stem can be lengthened in a very simple manner, which saves the expense of fitting a new valve. The foot of the valve stem is softened, if necessary, and a small hole is drilled axially in it, and tapped. Into this hole a screw is put which is filed down to the same size as the valve stem and of sufficient length to take up as much of the clearance as possible. An old valve treated in this manner will work quite as well as a new valve.

Deterioration of Rubber Washers

After a rubber washer has been under compression for some time it loses both its shape and spring. The same is true of the leather washer. This is generally found to be the case when any joint in which they form a component part is taken down after standing for some time, and it will avoid annoyance to make it a principle never to set up a joint of this kind without renewing the washers when they show any signs of wear. Once disturbed, the washer can seldom be replaced in exactly the same position as it occupied previously; its life is so far gone that it cannot re-adjust itself to the new place, and a leak results.

To Cure Engine Misfiring

When an engine begins to miss fire, the cause may sometimes be found in a loose and leaking joint in the gas pipe between the carburetter and engine cylinder. Tighten these joints and you will exclude the air, which is diluting the gas and thus causing the engine to miss.

Don't Tinker

Some drivers have a mania for tinkering around and making adjustments. This is responsible for as many troubles as is the habit of other drivers of neglecting their cars until the parts actually wear out and have to be replaced. Know your machine, but don't needlessly tinker. Give the manufacturer credit for knowing his business until the contrary has been demonstrated.

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

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WALTER WARDROP, EDITOR

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Motor Wagon Show

Plans are Ripening for the Conduct of an Exhibition of Business Motor Vehicles

SOUND reasons exist for conducting, annually, one or two exhibitions which will enable motor wagon manufacturers to display their vehicles and impress prospective buyers with the extent and variety of their use. The experience of establishments which exhibited at either of the automobile shows in New York, or the one held last month in Chicago, was not calculated to encourage a repetition of this expensive and inefficient mode of presenting their wares to the public. It was but too plainly noticeable that the great majority of visitors at these functions were not even remotely interested in the power wagon, had no conception of the industry which it represented, and regarded the weak display made in its behalf as somewhat of an intrusion. Inquiries at booths where wagons were displayed were few and far between, and even where they were comparatively plenty it was frequently found that the prospective customer desired information concerning a model which the limited space at the command of the exhibitor did not permit him to display.

The inadequate representation of manufacturing activity made it appear that the power wagon industry was not developed, that, in fact, it would remain undeveloped until the concerns now so busily occupied with the manufacture of touring cars could find liesure for urging it forward.

* * *

It is known to but few, and those only who find it necessary to keep close watch upon the industry, that there are about thirty concerns, major and minor, engaged in the manufacture of motor wagons. Among this number are some well known names in the automobile world. The majority, however, are exclusively engaged in the manufacture of commercial motor vehicles. Naturally, therefore, whatever inclination the former may have for perpetuating the custom of exhibiting motor wagons at an automobile show is not shared by the latter.

A separate show for industrial vehicles is what the concerns which have all of their capital invested in the production of them most desire. And probably if the establishments which are making both kinds of automobiles took time to reflect upon the subject, they would perceive the advantage of the proposed act of separation. The existing practice of mixing exhibits which are alike yet unlike, can only be excused upon the ground that it is expedient to do so. But the doctrine of expediency fails when its result is to retard development. It is discouraging to business men, having large investments in horses and wagons which they hope to convert by the purchase of power wagons, to be compelled to stalk through the aisles of an automobile show building and not find a single vehicle of the kind they desire to purchase, or more than a few people to whom they may sympathetically speak of their intentions.

* * *

The cost of conducting one or two national shows, at which a complete representation of the motor wagon industry might be made, could very easily under agreement among the exhibitors be kept so low as to be trifling. By eliminating the extravagance in decoration and staging of exhibits which characterizes touring car shows, the heaviest expense attending the conduct of a show might be avoided. In order to guarantee that none but interested persons would visit such exhibitions, admission might be by invitation, it devolving upon the executive committee or its appointee, to see that the invitations were widely yet judiciously scattered. An active and well informed mind can easily picture the profound interest which would be aroused

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in such an exhibition. Few merchants would ignore an invitation for themselves or their immediate representatives to a function which promised broad enlightenment concerning the economy of the power wagon and a display of the varied forms in which it is being manifested.

* * *

This subject received no slight attention during the week of the Chicago automobile show, when it was suggested, in order to give the commercial motor vehicle industry the specialization it deserves, that another building be leased for the purpose of displaying nothing but power wagon exhibits, and that the two shows be conducted concurrently under one management. It is doubtful if such a plan would work to the satisfaction of any of the parties in interest. The superior drawing power of the touring car exhibition would, with agents and many prospective customers who might happen to be unfamiliar with the division of the trade, very likely prove to be in interference with the drawing power of the motor wagon show. No doubt when the sentiment of the trade is ascertained upon this matter, this view will be upheld. Total separation of the industries is what is needed in order to establish the permanence of each before the public. Already there is an unhealthy sentiment abroad concerning the stability of touring car manufacture. Competition increases from year to year, productive facilities keep pace, but nobody will venture a prediction concerning the ultimate extent of the demand or its permanency. Parallelling this unwillingness to face the future is the openly expressed hope that the commercial motor vehicle industry will prove the more stable, it relying upon the business necessities of people for its maintenance rather than upon their desire for indulgence. If this is true, would it not be well to give both arms of the automobile industry the freest latitude in developing their strength, rather than tie them together and make the ill-luck of one the inheritance of the other?

* * *

The commonest phrase in the mouths of men today is that this is an age of specialization. Taking the utterance at its full value, it appears absurd that the methods which have been employed to exploit the automobile for pleasure should be reserved exclusively for those who are endeavoring to give the power wagon to the world. The noisy, bizarre and extravagant arts by which touring cars are kept before the public would be ruinous if applied to advance the power wagon industry. In this branch of work everybody is sober, and the majority are sane. Wagons are not bought until purchasers are well convinced that there is money to be gained through their employment. The atmosphere, therefore, in which the power wagon industry should be displayed should be one wholly suited to its severity. The idea of a separate show for motor wagons grows as it receives attention. It is sound and correct in theory, safe in practice, and should be attended with considerable profit for those who have the courage to participate in it.

It is probable that the first exclusive motor wagon show would open with a hundred exhibits, 30 per cent or more of which would be finished vehicles, and the remainder exhibits of accessories and equipment which are related to the finished product. If the project is taken in hand by a person or people of tact and competence there is little doubt but that an industrial motor vehicle show held in this or any other country would be highly successful, from whatever point of view considered. On the other hand, if there is not separation of the industries, it is inevitable that the power wagon will continue to live in the shadow of its aristocratic neighbor longer than is wholesome or advantageous.

PUBLIC PARK MOTOR BUSES

AS an accommodation to the aged, feeble and infirm the authorities of Pittsburg have decided to expend $30,000 in the purchase of motor buses which will operate in Schenley park, a recreation ground of large area. It has not yet been decided what form of power will be used to propel these vehicles, but as their seating capacity will be large, and their trips through the park will be frequent it is presumed that they will be fitted with gasoline engines.

ELECTRIC BUSES IN MARYLAND

THE project to operate electric buses between Annapolis Eastport, Germantown, West Annapolis and other suburban places, is the outcome of competition between two rival street railway companies for the use of the streets of Annapolis, Maryland. The automobile bus company is likely to get the franchise.

AMERICAN EXPRESS COMPANY IN LINE

A gasoline delivery wagon has been placed at the disposal of the Cincinnati agent of the American Express Company. If the vehicle proves satisfactory the whole of the company's road transportation will be accomplished by power wagons. As it is highly improbable that the company will fail to gain the substantial economy which other establishments, having less interest in cheap transportation, have secured by exchanging horses for power wagons, it may be taken for granted that the second of the big express companies of the country has become converted to the new religion.

It is unofficially understood that the company will buy 100 motor vehicles just as soon as a satisfactory demonstration of capacity and economy is made by the demonstrating wagon. This purchase, of course, will represent but a small part of the eventual outlay.

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Operating Under Difficulties

Motor Wagons Triumphantly Demonstrate Their Superiority to Horses in Deep Snow

SOME years ago, when only electric wagons were available as competitors of draft animals, a good deal of discussion was heard concerning the ability of the machines to hold the streets in winter weather. As time went on and these early vehicles easily demonstrated their capacity for work under the most adverse circumstances, the question ceased to have any practical interest for operators beyond the fact that the traveling radius was slightly curtailed, owing to the greater electrical draft caused by slippage and increased traction resistance. Few concerns, however, who had reached that point in the administration of electric wagons where the thought of putting them out of commission for any cause short of incapacity for service was tolerable, admited that the electric machine was one whit inferior to draft animal transportation under the most unfavorable weather conditions. What was crippling to one was recognized as crippling to the other.

The introduction of the gasoline wagon, with its superior range and power, wholly disposed of the objections which imagination urged against the employment of motor vehicles of any type in winter. While there are a few concerns today which suspend the operation of their electric vehicles when a heavy snow storm has rendered street traffic difficult, they do so, not because the machines are incapable of keeping the streets, but because the attending battery charging accommodations are unequal to the occasion. Nobody with a gift for administering gasoline wagons pays more than the slightest attention to the variations of weather.

* * *

It has been very noticeable, during the past few months, when snow storms and slippery streets impeded city traffic of all kinds, that in a comparison of duty performed by the various classes of vehicles seen on streets, both the gasoline and electric wagons acquitted themselves with marked credit. At a time last month, for example, when the street car service and draft animal transportation of New York and Chicago was not merely hindered, but sometimes blocked by the mass of snow which had fallen, motor wagons of all kinds continued to perform their work uninterruptedly. There is even on record a picturesque incident in which an automobile went about the city of New York rendering aid to teams and horses which were slipping, staggering and floundering in the snow, while the number of cases when motor wagons of all kinds rendered similar aid is beyond count.

The electric cab service in New York was operating without the slightest interruption during the period of the first heavy snowfall of January. Light and heavy motor trucks went about their business as if the unusual conditions which prevailed were normal. There is no means of knowing to what extent the draft animal service of the metropolis was crippled at this time, but it is pretty clearly indicated by the fact that one day when the severity of the weather was at its height, the owner of a large number of horses and wagons called upon an engineering firm which makes a specialty of advising establishments concerning the most suitable methods for applying power wagons, and declared that the increased expense caused by the necessity for hiring additional horses in order to transport a given tonnage through the snow-covered streets, was so heavy as to lead him to believe that the road machines possessed unrivalled advantages both in fair and foul weather.

It was not merely motor wagons of light carrying capacity which thus distinguished themselves. Even the heaviest machines performed to great advantage. It is a matter of record that the London motor bus service, the vehicles of which when loaded weigh seven tons, was not appreciably affected during a week of singularly severe weather in which the roads were alternately sheeted with ice and snow.

* * *

Some slight difficulty, of course, was experienced by the operators of gasoline wagons in keeping lubricating oil from thickening and engines from becoming cold, but wherever skilled care was exercised the machines emerged triumphant from the test. In part this highly creditable record was due to the use of non-skidding devices on tires, to increased operative skill on the part of drivers, but chiefly to the reserve power which all gasoline wagons contain. While this test of reliability was scarcely needed in order to impress establishments which have been using commercial motor vehicles for some time, it evidently exercised a beneficial effect upon concerns which as yet have only given light consideration to the matter of employing them.

But the most remarkable demonstration of the superiority of power wagons in severe winter weather conditions was manifested in the 300-mile trip which a two-ton wagon made in running from Detroit to the Chicago automobile show. Throughout the course of this difficult undertaking nothing worthy of note occurred, notwithstanding there were several steep grades to be ascended and descended and snow varying in depth from five inches to two feet was frequently encountered. The details of this journey, which are recorded elsewhere in this issue, are not less interesting than they are instructive, establishing, as they do, the value of the generalization, that wherever the motor wagon can find traction its merit increases in inverse proportion to the road difficulties.

* * *

The superiority of power wagons to snow and ice in a large city being granted, it becomes a matter of interest to consider the enormous annual waste of money which is expended in keeping streets fit for winter horse traffic. The first snow storm of the season in New York put the

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municipality to an expense of $785,000 before the streets could be said to be fit for travel. It is needless to point out that this expenditure was not made for the purpose of facilitating motor wagon traffic. The second snow storm, which occurred some weeks later, was not so severe as the first, and on that account the municipality was only taxed $250,000 in order to restore the streets to their normal condition. Consulting the city rceords for the past decade it is found that this expenditure of $1,000,000 is considerably less than such work usually costs. It is, of course, very apparent to thoughtful students of municipal economy that a much cheaper method than now prevails might be employed for removing snow from the streets of a large city. Human and horse labor is expensive. The proposal to melt snow by means of a very hot gas flame issuing from a pipe, extending over a large section of the street, placed close to its surface and made a part of a motor wagon, is well thought of in adminstrative circles where the discharge of political obligations by the employment of human labor does not obscure economy.

Abroad, where the work of city corporation street cleaning is largely performed by means of motor vehicles, horses and men are not employed except where their service becomes indispensable. Motor street sweeping has been demonstrated economical in so many cities in Great Britain and Europe that it is about time the authorities in some of the principal cities in this country gave it a trial.

LARGE ORDER FOR MOTOR CABS

IT is reported that an order for 4,000 gasoline cabs has been placed with the Darracq company by a syndicate which proposes to operate such vehicles in many of the principal European cities. The amount involved in the transaction is about $5,000,000, upon which a heavy deposit has been paid. Delivery of 1,500 cabs will be made this year; 2,000 will be delivered next year, and the balance the year following.

A newly designed chassis will be supplied. Gear box and differential casing will be one casting resting on the dead rear axle. This construction will facilitate removal of the gears for repair. Two types of engine will be fitted, one of 10 hp. and two cylinders, and the other of 12 hp. and four cylinders.

The cabs will be of landaulette pattern. Five hundred of them will be delivered to the United Cab Company of London.

LONG DISTANCE ROAD FREIGHTING

THE consulting engineer and general manager of the Nugget Canyon Placer and Dredging Company of Oregon recently returned from a trip to the San Juan river in the southeastern part of Utah. The object of this trip was to look over the country and pick out a route for a motor wagon road to the placer fields belonging to the company. The company is a big syndicate with an unlimited amount of capital behind it. Senator W. A. Clark is one of its largest backers. The company has about 1,500 acres of placer lands on the San Juan river and will expend about $50,000 on the road between Winslow and the company's fields, a distance of 200 miles. When in full operation about 160 men will be employed. The first shipment of freight will consist of twelve to fifteen carloads of machinery and there will continue to be a great amount of business going back and forth, besides the ore to be hauled to the railroad. As soon as things are in operation three 3-ton motor trucks will be put in commission.

ENCOURAGING ECONOMIC OPERATION

COSTS of operating motor wagons are often likely to be what good or bad drivers make them rather than what manufacturers or owners estimate they shall be. Clearly, therefore, owners should do all in their power to improve the ability of their drivers. When the means for such cultivation is not denied, and the drivers are progressive, it is inevitable that operating costs should be reduced. There are large rewards for liberal behavior toward drivers. It undoubtedly pays to induce them to put forth their best efforts, even if a money consideration, apart from regular wages, is needful for the purpose.

Some time ago a manufacturer of motor wagons, believing that the drivers of wagons he sold to customers needed stiumlation to do their best, offered a certificate of merit and a prize of $25 to all who could prove that the cost of running 5,000 miles, including tires, fuel, lubricant, repairs and renewals, did not exceed $210 for a vehicle equipped with a 10 hp. engine, $235 for one fitted with 12 or 14 hp., $260 for 16-20 hp. and $310 for 26-30 hp. Each driver was given a book in which to record all operating costs. The other day it was reported that a one-ton covered wagon had been driven 5,138 miles in average service at a cost of $160.

Such a record ought not to be uncommon. Nor would it be if suitable encouragement was offered drivers to exert themselves in a cause of so much importance.

TO IMPROVE MEXICAN POSTAL SERVICE

USING horses to transport the mails between Tepic and Mazatlan, in Mexico, requires three days. The postal officials of the territory have decided to improve the service by employing automobiles, calculating to reduce the time to 15 hours. The new postal vehicles will be of the gasoline type and will be especially constructed for the service. Tires will be protected from puncture by a steel wire netting. The roadway between Tepic to Mazatlan will be rebuilt and kept clean so as to make traffic easy and safe.

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One of the Steam Driven Mail Collection Wagons Used in Milwaukee; Built by the Johnson Service Company.

Motor Mail Wagons

Extensive Service Planned for Motor Vehicles in Postal Work—Milwaukee's Steam Wagons

FOR some time past it has been unofficially known that the first assistant postmaster general was friendly to the employment of the motor wagon in mail collection service, but until the appearance of his recent annual report it was not suspected that his advocacy of it was largely due to a recognition of its usefulness in other fields of business enterprise. This is what he says:

During the past year, for the first time in the history of the department, arrangements were made for the introduction of an automobile service in the collection of city mail. Under a contract that went into effect on the 1st of October last, two specially equipped automobiles are being utilized in the collection service of Baltimore. Favorable reports have been rceeived regarding them, and the department is now planning for a similar collection service in several other places. It is believed that in large cities automobiles can be advantageously substituted to a considerable extent for the horse carts now employed so generally in collecting mail. By the use of automobile vehicles a much speedier collection service can be organized without added expense. Plans are being considered also for the introduction of the automobile in other branches of the city postal system with the purpose of quickening as far as possible the handling of the mails. Unquestionably the motor vehicle can be made an important factor in the postal service, as it already is in other business enterprises.

* * *

The impelling cause for the employment of motor mail wagons is disclosed in the sentence which declares that "by the use of automobiles a much speedier collection service can be organized without added expense." The statement is a cautious one. However, we hope to have the pleasure of seeing it amended one year from date, when the maintenance of the new service shall have been demonstrated less costly than the service it supersedes. There is more economy in the motor postal wagon than is represented by its superior speed, great as this is. Thus far the postal department has only experimented with machines having light carrying capacity. By the time its experience extends to the uses reserved for the heavy motor truck it will appear that the cash gain in operating between railway depots and main postal stations is very considerable. In large cities the location of post office sites and railway stations may be regarded as fixed. The traffic between them is steadily increasing. It is in this service, lasting throughout the day and night, that the motor truck of high load capacity and fair speed can earn its keep. In less important centers, however, the tendency is to place the post office in such proximity to the principal railway station that the mail can be delivered from the train to the working room without intermediate hauling. Steps have been already taken to secure a number of post-office sites at points immediately adjacent to railway terminals. This plan of locating minor postoffices will eliminate the heavy wagon service between the office and the railway, a service that unquestionably represents the slowest stage in the present system of mail distribution.

The cost of horse hire, street car service and special delivery work in the postal department during 1906 amounted to about $1,904,500. Had motor wagons, motor tricycles and motor bicycles been employed it is not to be doubted this expenditure would have been heavily reduced, and the service it represented greatly benefited.

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The keenest interest is being shown by postmasters throughout the country in the motor mail collection service

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now being operated in Baltimore with gasoline vehicles, as well as in the service being conducted in Milwaukee by means of steam machines. Many letters have passed between the postmasters in remote parts of the country and their confreres in Baltimore and Milwaukee regarding the nature of the service which the vehicles are performing, the details of their construction and the methods employed or to be employed for their care and administration. The postmasters at Louisville, Nashville, Omaha and Detroit evince marked interest in the Milwaukee installation, which consists of three vehicles made by the Johnson Service Co., of Milwaukee. The body construction of these vehicles is quite interesting. Many useful features not heretofore applied to commercial wagons in this country are found in them, such, for example, as heat radiating pipes circling around the platform of the machines to keep the occupants warm, and all conveniences for sorting mail so that upon the arrival of the vehicles at the central station the mail collected is ready to turn over to the stamp canceling machine. Two postal officials comprise the crew of each machine, one a driver and the other a collector. It is calculated not to make a longer stop than ten seconds at each mail box. Within the time occupied in traveling from one mail box to another the collector is supposed to have sorted the mail so that it can be handled with the utmost speed at the central office. By sending a collector with the driver, and charging him with the duty of "facing" the mail collector, it is hoped to reduce operating expenses in the central station where special help is usually required for work of this character. When the motor mail collecting service is in thorough working order half hour collections will be made in the most important business sections of the city. Carriers in the outlying districts will be instructed to empty every mail box they pass, and carry the mail so collected to points within the radius of the motor collecting wagons. The chief aim of the Milwaukee postal department is to get mail from all boxes and stations to the central office with the least possible delay. Postmaster Owen, of Milwaukee, expects to operate every day in the year, regardless of the weather.

The body of the Milwaukee wagons is mounted on a regular 112 inch Johnson chassis. It has the general appearance of a street car. The object of the upper deck is to give room for the distributor to stand up. On one side are mail racks for four pouches; on the opposite side is a distributing table with trays for letters. The collector seen in the rear of the car obtains letters from mailboxes, and on passing from one box to the next he distributes them in the car. One of the mail pouches is for packages, the other three are for letters for sub-stations in the city which may be sent directly there without having to go through the general post office. The total weight of each vehicle is 3,100 pounds. They will make any grades in the city and can be run on a level at a maximum speed of 30 miles per hour.

* * *

Postmaster Harris, of Baltimore, has been closely observing the performance of the three gasoline mail collecting vehicles placed at his service last October. He states that the vehicles have proved valuable adjuncts to the service, not merely in the matter of expeditious performance of duty, but from the viewpoint of a service economist. Like Postmaster Owen in Milwaukee, he has been bothered by the principal postmasters in the east and south for details of the motor wagon service. Those who can spare time from their official duties visit Baltimore and are furnished with permits to ride on the motor mail collecting vehicles and observe for themselves the efficiency with which this important work is conducted.

Probably if long established custom had not stood in the way the use of motor mail wagons would long since have been general in all large cities. The prevailing practice of letting horse contractors haul mail is as old as the government itself. And naturally the postal authorities have been averse to taking this privilege away before it was definitely known that these governmental agents were unwilling or unable to keep pace with the march of progress. The horse mail hauling contractor, however, shudders at the mere mention of the motor wagon. Fearing to operate it, and uncertain of its economy, he drifts to his doom. Meanwhile the pressure upon the postal service is becoming more severe with the passing of every year. In its extremity the department seeks aid in another quarter from those who live by the sale of automobiles. But they are too busy or too indifferent to take advantage of the important commission awaiting their acceptance. In the situation there seems to be nothing for the department to do but operate the machines, however little inclination may exist for such work.

The operation of horse-drawn vehicles by the postal department is and always has been out of the question. The use and administration of motor wagons, however, is neither difficult nor objectionable. In course of time one may look to see them operated and maintained by government unless the present contractors for mail haulage develop an ability to make progress or realize the peril of their investment in horses and wagons.

FUTURE OF THE INDUSTRY

A FEW weeks ago one of the most prominent motor car makers in the state of Michigan delivered himself of this utterance concerning the future of the motor wagon industry:

"The future of the automobile lies in commercial vehicles. There can be no denying that the present extreme popularity of pleasure cars is somewhat faddish. While I believe that pleasure automobiles will always be in use, I just as firmly believe that the permanence of the motor car is proved by the growing popularity of auto trucks and delivery wagons. At the present time, my firm makes only pleasure cars. So great is the demand that we cannot supply it, even by working overtime. Some of the directors are for enlarging the factory. But I am opposed to such a move because I believe that a couple of years from now we will be making more commercial than pleasure cars. If our factory is ever enlarged it shall be for the purpose of building auto trucks."

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Impressed in Military Service

All Kinds of Motor Wagons and Buses to be Hired or Bought by British War Authorities

WHILE it may not seem that the military authorities in any country are as eager to purchase motor wagons as merchants or others having a strong financial interest in their use, nevertheless it is certain that the thought of employing them in large numbers, both in times of peace and war, is never quite out of mind.

Army executives, but more particularly those connected with the transport department, zealously profess belief in the utilitarian advantages of the motor vehicle, and whenever occasion offers test the soundness of their opinions by field and road trials for light and heavy wagons. It does not flatter national pride to remember that the experience developed from these trials is practically held as a monopoly by foreign armies, or that important military defense plans, based upon the employment of the automobile, have been hatched out by all the ranking nations except ours. Observe the formidable plan which the British army council has devised for impressing, in times of national distress, all the automobiles, motor wagons, motor buses and motorcycles which are owned and registered by subjects of the crown. This right of commandeering is similar to that which is now exercised with respect to private ownership in ships and horses, an annual retaining fee putting a certain percentage of property available in war at the command of the government, with the option of hire or purchase.

* * *

The British war department is particularly anxious to control the employment of heavy motor wagons. Its agents, in their preliminary draft of a measure which it is expected will eventually become law, have selected the following types of vehicles as possessing qualities likely to prove of most value in an emergency:

1.—Traction train units, each consisting of a road locomotive, three trailers and a water cart.

2.—Tractors with one trailer, capable of carrying a useful load of 3 tons and over.

3.—Motor wagons with capacity of 3 tons and over.

4.—Covered motor wagons, with capacity of not less than 2 tons, nor more than 3 tons.

5.—Covered motor wagons with capacity of not less than one ton, nor more than 1½ tons.

6.—Motor buses, with useful load capacity of 3 tons.

* * *

Vehicles of the classes enumerated above are to be registered for hire or purchase by the war department. The registration fees are as follows:

Class 1, $10 per annum, and 60 cents for each extra trailer.

Class 2, $10 per annum, and 60 cents for each extra trailer.

Class 3, $10 per annum.

Class 4, $7.50 per annum.

Class 5, $5 per annum.

Class 6, $10 per annum.

If the vehicles are hired the period of hire shall be either not less than 15 days nor more than 30 days in any one year, or not less than 5 days nor more than 14 days in any one year. The period of hire is to be continuous. No payment for hire will be made unless the various classes of vehicles perform journeys of stipulated length within twenty-four hours. For example vehicles of Class 1 must travel 24 miles a day; vehicles in Classes 2 and 3 must make a daily mileage of 40 miles; all other vehicles must travel 100 miles a day. The war department will pay for the rail dispatch of all hired vehicles to distant points, as well as for the rail transportation of drivers and their assistants.

* * *

In the event of a hired vehicle breaking down en route to the war department depot at which the war department requires it to assemble, or being found to be unserviceable on arrival thereat, the department shall have the option of:

1.—Refusing to accept the vehicle for service, in which event the war department shall be liable to pay one day's complete hiring to the owner.

2.—Effecting the necessary repairs, in which event the owner shall forfeit one day's hiring.

* * *

The owner of the vehicles shall provide the drivers and assistants, and find their pay, food and accommodation. The owner shall provide for the upkeep of the vehicle, and shall provide all petty stores and spare parts necessary to that upkeep, except that the war department shall provide, without charge, all water, fuel, oil for lamps, lubricating oil and grease required for the running.

The war department will not be responsible for any damage to a vehicle, nor for any derangement of its mechanism which may arise while employed under normal conditions and under circumstances similar to those in which the vehicle is usually employed; nor will the war department pay for the hire of a vehicle during the time which it may, owing to such damage or derangement, not be available for work except in the case of minor and temporary derangements. But in the case of damage or derangement which may be attributable to the special and peculiar nature of the work on which the vehicle is employed, the war department will make good such damage and derangement, and will pay for the hire of the vehicle during the whole time that it may be consequently away from its regular work. In the case of a dispute arising as to the cause of the damage or derangement, or to the compensation due, the matter shall be settled by the arbitration of two arbitrators or their umpire.

* * *

At least, thirty days' notice in writing of the com-

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mencement of a hiring shall be given to the owner by the war department. The rates to be paid for hire to be as follows:

	Per Day
Class 1, including driver and two assistants	$20.00
Each additional traction wagon	1.25
Class 2,—October to February	20.00
—March to September	30.00
Each addition trailer	1.25
*Class 3.—	20.00
*Class 4	15.00
*Class 5	10.00
*Class 6.—June to September	75.00
—October to May	37.50

*Including driver, and when a trailer is used (Class 2) one assistant.

* * *

If His Majesty's principal secretary of state for the war department shall certify in writing, under his hand, that the country is in a state of national danger, or if a proclamation shall be issued under the Reserve Forces Act, 1882, then while such proclamation continues in force, or such certificate remains unrevoked, the war department shall be entitled to purchase, as hereinafter mentioned, any motor vehicle registered hereunder.

Notice in writing of the intention to purchase any vehicle shall be given to the owner by the war department, and the owner shall, within ten days, in the case of vehicles in Class 1, and five days in the case of all other vehicles, after receipt of such notice deliver the vehicle at a point selected by the war department. The purchase price to be paid by the war department shall be the then value plus twenty-five per cent. No addition to this bonus of twenty-five per cent shall be paid by way of compensation for the disturbance to trade or on any other account. The then value of a vehicle shall be arrived at as follows: The actual purchase price of the vehicle shall be ascertained and depreciated at the undermentioned rates per annum, the depreciation being deducted from the depre ciated price from year to year.

Class 1.—Depreciation per annum .. .. .. 7½ per cent.
Class 2.—Depreciation per annum .. .. ..10 per cent.
Class 3.—Depreciation per annum .. .. ..12 per cent.
Class 4.—Depreciation per annum .. .. ..15 per cent.
Class 5.—Depreciation per annum .. .. ..15 per cent.
Class 6.—Depreciation per annum .. .. ..15 per cent.
Trailers.—Depreciation per annum .. .. ..7½ per cent.

provided that the value thus calculated shall never be less than thirty per cent of the original cost. In the event of a vehicle being found unserviceable when delivered the war department may reject the same.

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After studying the details of this broad and comprehensive plan for the extensive employment of motor vehicles in military service one feels a sense of shame in recalling the futile endeavors of American army administrators to arouse interest in the same subject. A little while back, when the quartermaster general's department, in its anxiety to ascertain the value of motor road transport in different parts of the country where army manœvers were being held, invited the cooperation of makers of motor wagons, it committed the folly of offering as full payment for distant power wagon service the petty sum for which stores and munitions may ordinarily be transported by horses or mules. Not a cent was available for transporting machines or operators to the scene of action. It was rudely calculated that as it cost so much per ton mile to move army stores by draft animals, power wagons would be forthcoming to accomplish the same work at the same wage. The result might have been anticipated. Not a single power wagon was present at the maneuvers. In contrast with this we see the British war authorities preparing to offer $20 a day for the service of a 3-ton wagon and guaranteeing such liberal treatment in the matter of operating supplies that the owners of such vehicles need not greatly regret the temporary absence of their property. Even depreciation has been thoughtfully considered and suitable compensation provided to cover it. Let us hope that future attempts to establish the usefulness of the motor vehicle to the American army will be conceived in a more catholic spirit. The liberality of the British plan will go far toward securing its success.

MOVABLE WIRELESS TELEGRAPHIC STATIONS

AN important use has just been found for the automobile by Marconi. The power plant of the vehicles is used for propulsion as well as for generating electrical energy for radio-telegraphic transmission. The arm required for telegraphic transmission is fixed to the roof of the vehicle and is of telescopic pattern like the ladder of a fire engine. In about ten minutes this motor vehicle station can be made ready for action to its utmost distance, about 100 miles. The wagon carries the pole, apparatus and operating staff.

The inventor's secretary has taken out patents on the machine and, if he is successful in obtaining the patronage of the Italian army authorities, will organize a company for the manufacture of the cars and apparatus. Telegraphic units of this kind should prove extremely valuable in military operations.

MOTOR MAIL VAN RECORDS

SOME very remarkable mail van records are available as a result of the operation of such vehicles between London and Brighton under contract between the British postal department and a large firm of contractors.

The figures show: Possible number of journeys, 1,008, equals 59,976 miles; actual number of journeys, 1,006, equals 59,857 miles; lost number of journeys, 2, showing that only .198 per cent of the total mileage was lost, or less than one mile in every 500.

Another motor service of like character shows that in 75 journeys, aggregating 5,100 miles, not a single mile was lost. This service covers a period of nine months.

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Care of Solid Tires

Rules for Their Economic Maintenance Formulated for the Benefit of Owners

THE importance of formulating rules for the care of solid rubber tires will not be underestimated by those who have acquired by dear experience information which they might have gained by precept.

Being the largest single item in the annual expense for the maintenance of power wagons, tires very naturally occupy a large share of executive attention in establishments where vehicles are numerous and well administered. Heavy losses can be incurred by neglecting to give attention to tires. Numberless instances are on record where the mileage of a set of tires has been heavily reduced simply because the operators of the vehicles, or their superiors, did not deem it worth while to ascertain if front and rear wheels were parallel, or because loads and speeds were badly adjusted to fixed tire sizes.

* * *

In the course of a communication recently received from a large Chicago firm, which for some years past has been operating motor trucks, it was curiously complained that the vehicles could not be termed "successful" inasmuch as the annual cost of tire maintenance was very high. The vehicles in question happen to be 5-ton trucks which are operated with great activity. The annual tire expense for each machine is about $500. It was stated by the manager of the establishment that the service of these trucks was highly economical, and under no circumstances would he return to the use of horses; and yet despite these admissions the vehicles were pronounced unsatisfactory. Clearly it was the size of the tire maintenance account which provoked this unfair criticism. Nothing in the communication, or subsequent investigation of the operating plant, indicated that this hypercritical beneficiary of the power wagon had done all in his power to obtain the greatest mileage or tonnage, as the case might be, from the tires on his vehicles. Indeed, inquiry developed that only the most indifferent care was expended upon tires. So long as they remained on the wheels, and were above the rim, no complaint was heard. It was only when renewals had to be made that their shortcomings were lamented.

All will recognize in this satisfied yet critical investor the greed of commercialism. Not content with making a profit by the substitution of machines for horses, he wants usury instead of fair interest on his investment.

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Eight suggestions for the economic maintenance of tires have been incorporated in a pamphlet recently issued by the Firestone Tire & Rubber Co. They are as follows:

1.—The greatest causes of excessive tire expense are overloading and overspeeding. One large operating company dismisses employes who overload as much as 50 pounds. Rubber has a certain amount of "life" and if persistently overworked it cannot recuperate.

2.—Keep brakes working equally and all wheels "trued" up. This not only economizes in wear on the motor truck, but prevents unnecessary strain on any one of the tires.

3.—Do not allow oil or grease to accumulate on tires, as they cause decay.

4.—Avoid exposing tires to great heat, as it destroys the wear-resisting properties of the rubber.

5.—Start the truck in a straight line before turning the steering wheel; because by turning front wheels when truck is standing still a heavy and unnecessary strain is placed on the fastening device of motor tires of any make.

6.—Start gradually; avoid jerky motions under all circumstances.

7.—Do not persist in running vehicles along street car rails. This grinds down the edge of the tire.

8.—As merely resetting or repairing a tire will, in many cases, double its life, users are urged to consult us freely in order to secure economy in this respect.

One of the most fruitful sources of tire wear is unmentioned. That is, carelessness in selecting the path in the roadway to be traveled. If the durability of rubber is dependent upon its "life," and that quality is destroyed by overloading and overspeeding, its destruction must be further hastened by want of judgment in steering.

Doubtless it was not the wish of the authors of the foregoing suggestions that no latitude should be given in the matter of overloading. However desirable it might be to have loads nicely proportioned to vehicle ratings, in the great majority of transportation services, it is necessary to make liberal provision for emergencies. It is not uncommon for horse drawn express wagons to be overloaded 200 per cent of their rated load capacity. Only establishments in which the nicest control can be exercised would find it practicable to limit the overload of their motor vehicles to 50 pounds.

Beyond a doubt the wear of solid rubber tires is greatly augmented by the too free and rough use of brakes. It is the opinion of most of the administrative engineers attached to large motor bus operating companies, that if drivers would apply the brakes gently and with circumspection, a tire on these seven-ton vehicles would uniformly last for 20,000 miles.

The tendency of drivers to use the tracks of street railways causes severe wear to solid tires. Commonly the pavement is lower than the rails; and when a motor vehicle is obliged to cross the tracks at a small angle the tire fastenings are sometimes wrenched or broken, the rubber is subjected to severe wear, and skidding, which puts great strain upon the frame and working parts, generally takes place.

The police department of Richmond, Va., has purchased a motor patrol wagon.

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Motor Bus Finance

Enormous Volume of Business Transacted on Comparatively Small Investment

IT has been demonstrated in London that more passengers can be carried for each dollar of capital invested in motor buses than for each dollar of capital invested in surface railways. The largest of the local street railways, with a capital of $25,000,000, carries about 180,000,000 passengers annually, or a little more than seven passengers yearly for every dollar of capital. This system is operated by the municipal authorities. A second street railway system, operated by private capital and backed by $15,000,000, carries 48,000,000 passengers yearly, or only about three passengers annually for every dollar invested. A steam railway which relies upon the inhabitants of London for its business, having a capital of $20,000,000 carried 45,000,000 passengers in the last year, or a little more than two passengers yearly for every dollar of capital invested.

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Compare these returns with those presented by the united motor bus industry of London, which, with capital investment of about $5,000,000, last year carried 184,000,000 passengers—thirty times the population of the metropolis—or about 37 pasengers yearly for each dollar of capital invested.

Experts consider that $5,000 per vehicle is ample for the cash capitalization of a motor bus company working under fair conditions. About 800 passengers per day may be taken as a very reasonable average for a London motor bus seating 36 passengers. It is also reasonable to assume that motor bus companies keep about 80 per cent of their vehicles on the road. On this basis it is easy to calculate that the motor buses of London are now carrying at the rate of 184,000,000 passengers per annum. Furthermore, if we take the very moderate amount of $20 as the daily gross earnings of a motor bus, we find that the vehicles in London are at present earning very nearly $5,000,000 per annum, there being about 800 machines in service. In order to grasp the sigificance of these figures, it is well to remember that the motor bus industry is only in a partially developed condition.

In the motor bus business the turnover is very large in comparison with the amount of capital invested. Indeed, a motor bus company with $500,000 capital may easily have a gross income of $600,000. Hence the importance of small economies which in the aggregate amount to large sums, for where the gross income exceeds the capital involved a saving of 5 per cent in the working expenses may mean a dividend of more than 5 per cent on the investment.

This study in comparative finance was discussed at a recent meeting of the society of motor omnibus engineers.

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Another matter which occupied attention was the nature and proper maintenance of road surfaces. As some criticism has recently been passed upon the motor bus on account of the vibration in houses adjoining the routes on which vehicles ply for fare, it was the decision of the meeting that the ill kept condition of the streets was wholly responsible for such complaints. However perfect a motor bus might be in construction, if the road surfaces are rough and contain holes, the mere fact of the vehicles dropping suddenly into cavities is bound to communicate tremor to the earth. This is not, as at first glance might be imagined, special pleading, for any vehicle of considerable weight passing over irregular road surfaces must communicate vibration to adjoining houses and thus cause the same complaint to lie against it which is exclusively charged as a misdemeanor against the motor bus. Nine-tenths of the noise caused by motor buses, and all of the criticism which it evokes, could be made to disappear if roads were smooth.

The pavements of most large cities consist chiefly of samples. One street is paved with asphalt, another with wood, another with granite blocks and another with brick. The result of this is that in wet weather the detritus from one form of pavement is brought on to another, and surfaces which theoretically should be clean are fouled and become unsafe both for motor vehicles and horses. The wear of streets is not due to motor vehicles, which improve rather than damage them, but to the heavy-footed and pounding horse, to thin iron tires, and all the other conveniences which ignorance affords for destroying costly municipal investments. It is not worth while talking about the noise of industrial motor vehicles, or the vibrations they cause to adjoining houses, so long as streets are laid down for horse travel and their surfaces are relatively soft as a convenience for these animals.

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Analysis of the hostility which has been directed against the motor bus shows conclusively that it may be classified under two heads: 1. Street railway investors who affect to see in the motor bus a direct challenge to the street car as a means for passenger conveyance; 2, the aristocrats who, having founded their houses in streets along which street cars are not permitted to operate, are shocked to discover that all vehicles cannot be debarred from the sacred premises. The commercial interests back of the motor bus, let us hope, will be fully able to protect it against the onslaught of the former. As for the latter, their case has been tossed out of court, in London at least, by the duly constituted authorities, who take the high ground that the motor bus has come to stay and that the people must be tolerant of its shortcomings. In this connection it is interesting to note the reply of the home secretary for Great Britain to a deputation of titled property owners who complained

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that "motor buses of unprecedented size and weight have been suddenly launched in the streets and keep up a horrible noise, shake residences, destroy sleep, wreck the nerves, depreciate the value of property, emit carbonic gases prejudicial to public health, and occasionally topple over to the peril of passengers and pedestrians." To these accusations, vehemently supported, the home secretary turned a deaf ear and icily pointed out that public service motor vehicles are not nearly so much of a menace to the public, or nearly so offensive to the public at large, as the thousands of touring cars and runabouts which litter the streets of London. All that he would promise by way of reformation was that the commissioner of police would attempt to secure reasonable protection for the public against undue noises and noxious fumes, a statement so ambiguous as to give cold comfort to his auditors.

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Whenever opportunity is presented a great hue and cry is raised over the number of breakdowns which occur in the London motor bus service. As a matter of fact the casualities in this respect are not greater than occur in the early stages of the development of any mechanical novelty. In all developments of new machinery reliability is only reached after an enormous amount of executive work and great expenditure of money for the purpose of eliminating features of weakness. In the early days of electric lighting, as many will recall, it was an everyday experience for the light to go out, usually at the most inopportune moment, as when it was in greatest demand and the load was at its maximum. Even today, it is not uncommon in cities of the first magnitude to find the electric light supply cut off for long periods; and even in Cleveland, within recent times, the whole city was denied the use of natural gas, owing to a break in the supply which executive forethought might have prevented, but which nevertheless it did not do.

Some ten years ago, when the operation of motor cars was undertaken for a distance of 60 miles over perfect highways, not 10 per cent of the vehicles which started arrived at destination. Today 24-hour non-stop journeys might be performed by almost any vehicle which is made, if it were placed in capable hands. In the early days of the steam turbine the liveliest faith was required to hold together the small band of prophets who recognized its inherent merit. Breakdowns were so frequent as to completely dishearten all but the most courageous. Nowadays ships of every nation are being fitted with this invention. Motor vehicles still occasionally break down, but their reliability has increased to such an extent that they may be depended upon for all practical purposes, just as public dependence is placed in the ocean steamship, the railway locomotive and other expressions of engineering ability which emerged from their dark and gloomy days of trial to the complete satisfaction of the public.

"RUBBERNECK" ROUTE FRANCHISES

A BILL has been introduced in the New York legislature which aims at compelling operators of sightseeing cars to secure a franchise before the vehicles are permitted on the streets or roads. The measure is a drastic one, and if it becomes a law will work hardship to an industry that has attained large proportions in recent years.

It is proposed to treat these vehicles as stage lines; to require that they secure franchises confining their operations to certain routes; to compel them to secure consent of a majority of the property owners on the thoroughfares on which they would operate, and after April 1 to have the consent of railways and stage companies already occupying the streets through which they run. This last requirement is in protection of those now holding franchises, and would seem perfectly proper were the big automobiles competing with them in the carrying of passengers at 5 cents a head. But there does not appear to be much competition between a vehicle that charges $1 for a seat, takes you all over the city and throws in an agreeable megaphone lecture on passing sights and a car with a five-cent fare, a strap to suspend yourself from and a goodly company of fellow travellers to tramp on your feet, poke elbows in your back and smash your hat. Until the rubberneck fare is reduced to at least ten cents, it is hard to understand why the street railway companies should be allowed to have a part in curtailing their operation on the ground of unfair competition. When they do begin to compete, when they offer for a nickel or a dime the same pleasures as are now given for a dollar, the public will demand the unhampered continuance of a system so excellent, regardless of the attitude of the car lines.

It must be many a year before the rubberneck wagon can become a stage. Its field of service must long be limited to entertainment of rural visitors, showing us to them and them to us. Doing this, should we legislate against it and its patrons? It is a question which has the greatest pleasure, the spectacled old ladies, the brides and bridegrooms, the solemn gentlemen in frock coats and derbies, who inspect us from their moving eminence, or ourselves, as we pause on the curb and "rubber" back, bored, supercillious, condescending, and watch them rumble by.

As to the part of the property owners, as demanded in the bill, that would be the hardest thing for the wagon managers to obtain. As it is, but a few of them are mentioned by name and pointed out by the megaphone lecturers as the machines lumber along the streets. The majority must naturally resent such discrimination. Envy will do its work. All or none, will be their cry; point us all out to our rural friends, howl out all the names to the world, tell all about us, about our wealth and our homes, or get off the streets!

The Sanitary Reclaiming Company, of Worcester, Mass., employs a gasoline truck in removing garbage and rubbish from office buildings and small manufacturing plants in that city. The refuse is transported in cans.

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Speed and Ordinances

As the Use of Motor Wagons Increases, Police Supervision Will Become Stricter

OBSERVING people perceive that the speed of motor wagons employed in city service will in the future wholly depend upon the liberality of the municipal authorities from controling vehicular traffic. If one may reason from the restrictions which are being placed upon the operation of touring cars, it is practically certain that the speeds now permitted for commercial motor vehicles will be diminished until eventually they are not greater than will enable owners to safely establish their economy. Such fantastic speeds as 15 or 20 miles an hour for 3 or 5 ton trucks cannot in the nature of things persist when the time arrives that the streets of our large cities are traveled by considerable numbers of industrial motor vehicles.

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It is not to be expected that the motor wagon will enjoy special privileges which are denied to touring cars. In every large city throughout the country the speed of automobiles is regulated by law, though for various reasons the law is not strictly enforced. The tendency everywhere, however, is to so moderate the speed of automobiles that it shall not be a menace to public safety. In Chicago the speed limit for automobiles is officially fixed at ten miles per hour, and while many motor wagons proceed at a faster rate of travel, it is impossible to think that such indulgence will be perpetually overlooked. For the moment police officials regard the automobile for pleasure as a thing wholly apart from the automobile for commerce. Broadly speaking, the latter vehicle has not yet come within their view. This freedom from supervision, however, is only temporary. As power wagons multiply, the danger from their excessive speed will cause police attention to be focalized upon them, and their traffic will be regulated with as much severity as industrial motor vehicle traffic is now governed in some foreign cities.

The official speed limit of automobiles in New York City is even less than the speed permitted within the city of Chicago. In both cities street corners must be rounded at about four miles an hour. The present speeds may be regarded as marking the extreme of freedom for motor vehicles upon all city streets except those which are exclusively reserved for automobile traffic.

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It has been pointed out in other issues of this paper that high speed does not necessarily imply proportional economy in the operation of motor wagons. On the contrary, there is a point beyond which speed may be decidedly disadvantageous, speed and load together representing the the factors which most contribute to expense of upkeep As, therefore, it is unnecessary for the success of the power wagon that its capabilities for speed should be developed to the utmost, sensible people will not be disappointed at the reduced speeds of the future providing they are not made so low as to wreck the whole scheme of the vehicle's economy. The problem is not to devise mechanical means for running away from the horse, but to out-distance him by as much as may be necessary to keep his service always inferior to that of the motor wagon.

Those who dislike to contemplate the comparatively slow rate of city travel to which all automobiles are gradually being compelled to submit, are not much comforted in turning to the rural and suburban districts and noting the vigorous measures which are there being enforced for public safety. At first glance it might appear that fast speed would be desirable in long distance motor wagon hauling. Such, in fact, is not the case, as, where motor wagons compete against horses in such service the physical limitations of the latter makes the superiority of the machines, with their constant speed, all the more apparent. One may travel in any direction from the heart of Chicago into the suburbs and not be permitted to operate a motor wagon at a speed greater that two miles an hour in excess of that allowed within the city itself, while in some small towns fifty miles distant the legalized speed is even less than that. The speed prescribed by law within the boundaries of some remote towns and villages in the state does not exceed six or eight miles an hour.

* * *

In this connection it is interesting to note a structural development of the present day. Prudent engineers gear motor wagons so that very high speeds are not possible. The 5-ton truck in which lurks a speed of 15 miles an hour is not the type of machine which engineers desire to construct or purchasers who have had experience with the maintenance of these leviathans care to operate. Moderate speed in a light wagon is all very well; in fact, it is a vital necessity in the majority of cases. But where loads in excess of one ton are to be carried the speed capabilities of the machine, if abused, can very easily be employed to defeat the very purpose for which the wagons have been purchased. While at all times the margin of economy is large in wagons which are well adapted to the service in which they are employed, it is not so large that it cannot be caused to disappear through careless operation.

On the whole it is fortunate that there are ordinances which regulate the traffic of commercial motor vehicles, and that in the future they are more likely to be honored in the observance than in the breach.

TO OPERATE MOTOR PARCEL SERVICE

CHICAGO is to have a public motor parcel service. The Chicago Motor Dispatch Company will go into operation in about ten days, fully equipped to handle parcels from all parts of the city at a merely nominal price. Six motor wagons have been contracted for and as soon as these are delivered operations will commence.

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Not Even Mildly Representative

The Chicago Automobile Show, Like Its Predecessors, Contained Few Motor Wagon Exhibits

THREE automobile shows, all national in character, have been held since the early part of last December, and at none of them did it appear that the power wagon was of more industrial importance than any of the mechanical freaks which were exhibited to catch the attention of the unwary. To find a power wagon at the last exhibition, held the first week of February in Chicago, required a concentration of purpose which few visitors possessed, unless they entered the building with that particular object in mind. All three attempts to do even justice to vehicles representing opposite uses having failed, it now remains to be seen how long the thirty odd makers of motor wagons will continue to exhibit in company with those who make vehicles for pleasure and enjoy the embarrassment they have unconsciously caused. A separate show for motor wagons seems to be demanded in order to sharply define their commercial importance.

There were few exhibits of motor wagons seen at the Chicago show which were not witnessed at one or other of the eastern shows. Those unnoticed before are herewith described:

Biddle-Murray Mfg. Co., Oak Park, Ill.

This firm exhibited a three-ton gasoline truck, with four-cylinder 50-hp. engine developing its rated power at 900 revolutions per minute. The power plant is so assembled that it is possible to remove any of its three distinctive parts without interference with the other two. This is a feature that is of especial interest to the repair department. The motor is water cooled. The vehicle is geared to maximum speed of 15 miles per hour. A force feed mechanical lubricator supplies oil to the working parts. Jump spark ignition is used. The coolers are placed in either angle of the seat staging, and are protected by an iron grating. Artificial radiation is induced by an exhaust fan. This clutch is of the multiple disc type, built in the fly-wheel, and running in oil. Attached to the propeller shaft end is a double universal joint forming the connection between it and the transmission. The transmission is of the selective type, giving four speeds ahead and one reverse. The control and interlocking device is placed in front of the driver's seat and is operated by one lever. The axles are 2½-inch I-beam front, 2-inch square rear, drop forged and equipped with roller bearings. The wheels are wood, 36ins.; with 14 spokes 2½ ins. in diameter. They are equipped with 5-inch front and 6-inch rear tires. The springs are semi-elliptic, 3-inch, 14-plate rear and 12-plate front. The main frame is of 4-inch channel steel, carrying a 3-inch sub-frame on which the power plant is assembled. The double outside chain drive is used. The sprockets are mounted upon a steel housing which is attached to the rear wheels. Assembled in the housing are powerful emergency expanding brakes. A band brake is mounted upon the outside of same, and a third brake is provided for on the propeller shaft. The steering gear is non-reversible. The spark and throttle are controlled by means of levers on steering wheel operating through post.

Mitchell Motor Car Co., Racine, Wis.

This firm exhibited a 3,000-pound worm drive truck. The four-cylinder engine is directly beneath the driver's seat. The front axle is formed of manganese bronze. The wheel base is 110 inches. Wheels of 32 inches diameter are fitted with 3-inch tires in front and 3½-inch in the rear. The truck will travel 15 miles an hour at top speed. Sliding gear transmission is employed. Worm drive is used instead of bevel gears. The company believes that the worm is well suited for heavy motor wagon work.

Soules Motor Car Co., Grand Rapids

This company exhibited a 1,500-pound wagon, fitted with 22-hp. engine having two opposed cylinders of 5½-inch bore with 5-inch stroke. The running gear has an angle iron framework, with side pieces offset in the rear of the motor and tied together by front and rear crosspieces. Motor support is direct on these side members. Re-inforcing this suspension is a crosspiece from the clutch housing to the left frame piece, this extra member taking the weight of the steering column. The front axle is iron of square cross section 1¾ inches deep. The tread is 56 inches. The car control is from the left side. Final drive is by cardan shaft.

MOTOR BUSES FOR PHILADELPHIA

A STEP toward giving the Philadelphia public relief from overcrowded street cars was taken recently when the City Councils' highway committee recommended for passage a bill permitting the operation of omnibus lines on any streets. Under the bill any number of companies can operate lines and the vehicles may be propelled by steam, gasoline or electricity or drawn by horses. No car will be allowed to weigh more than 24,000 pounds or carry more than 40 passengers.

The only stipulation in the bill is that the companies desiring to operate omnibuses must first obtain a permit and pay a license fee each year for each vehicle, as follows: Vehicle carrying 20 persons, $100; 20 to 30 passengers, $150, and from 30 to 40 passengers, $200.

The Auto Transit Company announces its readiness to put 30 electric buses on the streets by June 1st. At first these vehicles will run on Broad street from Chestnut to Diamond, thence on Diamond street to Fairmount Park. Later the route will be extended on Broad street to the Navy Yard.

MOTOR BUSES TO THE RESCUE

A COMPANY is being formed in Evansville Ind., to run an automobile loop along part of the route of the Evansville & Princeton traction line. The traction company is tearing up part of its line north of the city and will build into the city along a different route.

This will leave a thickly settled part of the country without interurban service, and the company being formed proposes to run automobiles along this route to connect with the traction cars. Seven machines will be used.

IN GOVERNMENTAL SERVICE

GOVERNMENTAL interest in the employment of motor buses and wagons is spreading with very satisfying rapidity. The minister for public traffic has agreed to the establishment of five new services of motor buses in Bavaria. On two of these lines heavy wagons of the kind illustrated on this page will be used.

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Gasoline Electric Transmissions

Paper Read on This Interesting Subject Before the Society of Motor Omnibus Engineers

ONE of the most attractive subjects for the study of mechanical engineers is the transmission of power and speed regulation on motor vehicles, from various types of prime movers. Next to the engine, the power transmission is the most important thing about the vehicle, and bad design may make a considerable difference in the power obtained at the road wheels. It has been proved, by actual test, that fully one-half of the power developed by the engine is often lost in undue friction between the prime mover and the wheels.

The system of transmission mostly used at the present time is that of metal gear wheels (in reality a group of three or more rotating levers); these provide not only a reduction of speed, but also a fairly proportionate increase of torque at the slower vehicle speeds, a thing which is absolutely necessary for motor buses and heavy lorries, especially when climbing severe gradients; but, as all will admit, this system is exceedingly noisy when the gear wheels are worn. It is not only an annoyance, but an eventual source of trouble and expense, for noise means wear. It may often be noted that drivers, rather than continually change gear, will run some considerable time with the clutch slipping, losing power thereby, and generating heat and wear on that piece of mechanism, while many breakdowns can be traced to that cause alone. There are, of course, very many ingenious and scientific pieces of apparatus, such as the Hele-Shaw and other plate clutches, and various makes of epicyclic gears, which have gone very far in helping to produce a few fairly silent-running vehicles.

Electric Power Transmission

Electrical power transmission, which has for its object the replacing of the mechanical speed-changing gear now in common use in connection with internal-combustion engines on road vehicles, is really the matter for discussion. That otherwise ideal prime mover, the internal combustion engine, has, at least, one fault: it is wanting in elasticity, and, in order that it may be satisfactorily adopted, some sort of variable speed-changing device is necessary. The system usually employed in gasoline-electric systems is that of a dynamo, coupled direct to the engine, which furnishes current for an electric motor, coupled mechanically to the road wheels, the vehicle being actually an electric car with, in place of the ordinary battery of accumulators usually employed, the engine and dynamo supplying the electrical power. But gasoline-electric cars possess the inherent advantages of not being restricted to a given radius of action, of requiring no recharging, as in the purely electric systems, and of being able to run the same distance as an ordinary gasoline car.

Probably the earliest gasoline-electric system employed was that of Patton (1890) in America, where he used electric tramcars, carrying a set of accumulators, and using a small engine driving a dynamo to charge the battery; the engine was always kept loaded and working at its full capacity, the accumulators supplying the current for the two electric motors.

The Dowsing System

In this system the engine drove a shunt-wound dynamo, both engine and dynamo being "belted" to the road wheels and so arranged that the surplus power from the engine was converted into current for charging a set of accumulators. The connections were so arranged that when the speed fell below normal the dynamo became a motor, drawing current from the accumulators, and assisting the engine on inclines. This system was more efficient than that of Patton; furthermore, the dynamo was used to run as a motor, taking current from the accumulators to start the engine.

The Germain System

The Germain gasoline-electric system had very good points insomuch that the field of the dynamo revolved round the armature, and the torque there produced was utilized in connection with the current generated to start the car. It will be observed, therefore, that a good portion of the mechanical power of the engine was transmitted direct to the road wheels. In starting a switch was closed; the field would then build up and with the motor would produce full torque at the road wheels. When started the resistance was switched on in shunt with the motor, thus gradually cutting out the motor and causing the speed to rise; the dynamo being series wound, the heavy current then circulated within its own field and armature. It will, therefore, be observed that when the difference in speed between the field and armature was small, such as when running on the level, it formed itself into a powerful magnetic and flexible coupling, a small current was generated, and when ascending an incline the difference in speed between the field and armature was greater and the car slower, more power being demanded from the engine.

The Hart System

This was introduced in the year 1903. Coupled to a 40 hp. engine was an enclosed compound-wound dynamo, which provided continuous current supplied through a series-parallel controller to a motor provided with two distinct windings on both the field and the armature; various speeds were thus obtained, and the motor was geared by single reduction to the differential countershaft, from which the side chains drove the rear wheels; for low speeds metallic resistance was used in series with the motor. This was at that time the highest-powered gasoline-electric car built; in fact, it has only just been exceeded by the 45 hp. and 70 hp. Mercedes which are now going through the shops in Vienna. With body it weighed under 2,500 pounds, and it could easily attain a speed of 50 miles per hour.

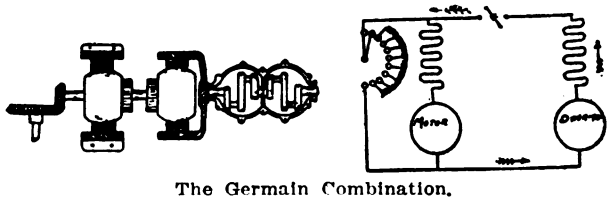
The Milde System

The Milde system was another engine dynamo, motor and battery arrangement, but of somewhat lighter construction, and was fitted with compound motors on the rear wheels, so the recuperation could be obtained when descending hills.

The Fisher System (Converted)

The Fisher system consists of gasoline engine which is directly coupled to a continuous-current dynamo, the dynamo being connected through a series-parallel controller to two 7 ½ hp. series-wound motors, each coupled through a double reduction spur and pinion gear to the rear wheels. The power of the gasoline motor shown is 22 hp., any surplus current being utilized for charging a set of accumulators carried on the vehicle, having a capacity of about 150 ampere-hours. This vehicle, with complete equipment, weighs just over seven tons. We show a Fischer lorry, converted into the Hart-Durtnall continuous current system. In this, you will observe, we have done away with the batteries and altered the winding of the generator and motor; it may be added that means are here provided for about 12 different speeds, or torque values.

It is generally admitted that one of the best methods of electrical power transmission for stationary work is with a series-wound dynamo and motor. It being assumed that the engine runs the dynamo at constant speed, it will be noticed that in the switch position shown no current can be generated, owing to there being no field windings in circuit. Therefore, by moving



The Germain Combination.

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the switch along the contacts, the field winding is dropped into circuit, and a low E. M. F. is generated; current then goes into the motor, producing, say, sufficient torque at the road wheels to start the car; owing to the voltage building upon the dynamo very gradually, the starting is very much more smoothly effected than is possible with the ordinary constant-voltage and series-parallel method of control. If, on level roads, an increase of speed on the motors is required, it is only necessary to pull the switch contact along still further, thus cutting out some of the windings on the fields, and increasing the speed, besides raising the voltage on the dynamo, owing to the then lower resistance of its external current. For hill-climbing, the central position is the best; the most power can then be transmitted with full field on both dynamo and motors; or, if climbing an extraordinarily steep incline, some of the dynamo windings can be cut out, this resulting in a heavy current at lower voltage, such current producing large torque at lower speed at the road wheels. It will be observed that as the main circuit is never opened, and as the field sections are short-circuited on themselves, no detrimental astatic discharges take place when running; also, when there is to be a sudden stop, the field of the dynamo is bridged over, and the magnetic field immediately lost: hence, as all power goes off before the brakes are applied, without altering any connections, it will be noticed that immediately the brakes are taken off the contacts open up the field again, and the dynamo gradually builds up the voltage, so that perfect starting is secured, and there is practically constant acceleration. For certain applications of electrical power transmission this simple system will yield good service.

The Lohner-Porsche System

We now show a Lohner-Porsche car which has been converted by eliminating the series-parallel method of control, though retaining the differential action of the two series-wound motors always coupled in series, which, at the expense of efficiency of power transmission takes place when turning corners. Recently, the Mercedes Electric Company has adopted the Lohner-Porsche system, but with the motors in the hubs of the rear wheels. This disposition of engine, dynamo and two motors cannot be accepted as an efficient one; our experience is that after two or three hundred miles on rough roads, considerable and costly attention is required at the brush gear, owing to the chattering of the brushes on the commutator, although in order to reduce this as much as possible it will be observed that the 12 sets of brushes in each motor are thrust on horizontally, which, as all electricians will agree, does not tend towards a cheaply-made machine.

Astle-Wallis System

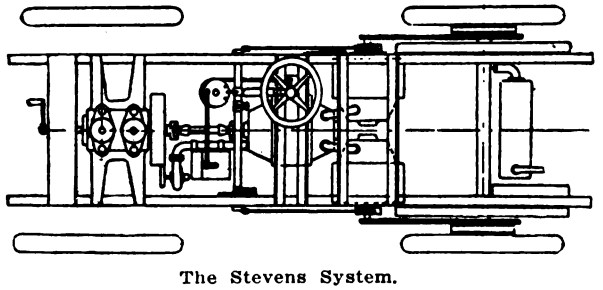
The novelty in the Astle-Wallis car does not lie so much in the combination of gasoline-electric power transmission, but, in a greater degree, in the employment of a single dynamo, this also acting as a motor in conjunction with a set of accumulators. It consisted of a 10 hp. two-cylinder engine, coupled through a friction clutch to a four-pole 2 hp. shunt-wound motor, and was so arranged that the method of running was as follows: The car was started at first by means of running the electric motor from the accumulators; then the engine was started by putting in the friction clutch. Immediately the engine fired and got up to half normal r. p. m., it began automatically to charge the battery; then, by means of operating an epicyclic gear, of a 3-to-1 reduction, the car was practically started on direct drive, after which the electric motor helped the engine to accelerate the speed of the car, and as soon as the normal speed was acquired the surplus power from the engine was utilized to generate current by means of the electric motor (then running as a dynamo and charging the set of accumulators). When the car ascended a hill, the dynamo ran as a motor and assisted the engine. The whole arrangement was automatic, and under the driver's control, by means of an eight-position 15-contact controller, embodied in which was a carbon break-switch which severed the main circuit when the brake was applied, and which was so arranged that the switch did not close the circuit again until the driver had placed the controller in the "off" or neutral position. When running downhill, the front clutch was drawn, and the engine stopped. The kinetic energy of the car was utilized in driving the motor as a dynamo for accumulator charging. Various braking effects, according to the severity of any gradient and the speed required, were obtainable; a heavy charge could be sent into the accumulators and the car made to descend a very steep hill at slow speed, no mechanical brakes being applied. From the electrical aspect this system promised good results.

The Stevens System

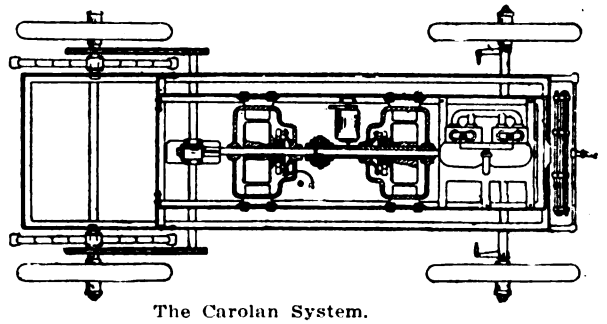
This is a continuous-current system. It utilizes a gasoline engine and two electric motors, and the series-parallel method of control is applied both to the motors and the dynamo, the latter being double-wound, with two commutators and two separate field windings. For prevention of sparking and burning at the controller fingers a resistance is employed, operated by the foot pedal which opens the main circuit when changing from one speed to another, and on reversing. This system from an electrical point of view, has very good features, as when climbing a hill the winding of the dynamo can be put in parallel, and the engine run at full speed, while the car proceeds at about quarter speed, with increased torque at the road wheels, with the motors in series. Forced ventilation is introduced to take away any heat that may be generated.

The Carolan System

Another of the direct acting systems, consisting of a gasoline engine, dynamo, motor, and a differential gear between the dynamo and motor; its operation is arranged for a nine-finger controller, and the engine drives, directly, the center member of the differential gear carrying the pinions. When the car is standing, the back bevel wheel, to which is attached an electric motor, is stationary, with the result that the forward wheel is revolved at high speed. Attached to this forward bevel is the armature of a series-wound dynamo. When the controller permits, the main circuit is closed, with the result that the dynamo generates a current, and by so doing produces torque in the same direction as the rotation of the armature, and at the same time the current goes through the electric motor and produces a starting effort on the road wheels. When the speeds of both motor and dynamo are equal, a direct drive is, of course, available. By weakening the field of the motor, a speed above that of the engine can be attained on the back propeller shaft. Whether the interposition of a toothed gear between the crankshaft and the armature, which forms the engine flywheel, worked satisfactorily and noiselessly, is questionable. This method of electrical transmission



The Stevens System.



The Carolan System.

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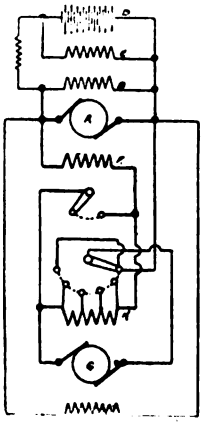
is, however, not bad, and, provided the engine put on the car was powerful enough for hill work, some good results were, possibly, obtained.

The Krieger System

A number of cars have been built on this system. It is so arranged that the dynamo can generate, practically, constant watts, i. e., a small current at high voltage for speed on the level, or a heavy current at low voltage when climbing gradients. It will be observed that no series-parallel working is utilized. A



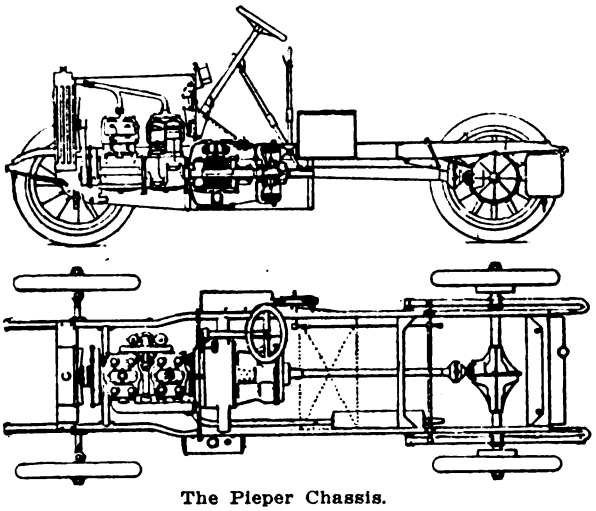
Krieger Constant Watts System.

is the armature of the dynamo; B the self-exciting shunt winding of dynamo; C independent exciting winding, also on the field of dynamo; D battery of accumulators, used for maintaining the excitation and for running dynamo as motor to start the engine; E resistance controlling the charging current from dynamo when running; F a series winding, so arranged that it demagnetises the dynamo field; G armature of motor; H series excitation of motor; I a demagnetising coil, excited by the dynamo armature. The connections shown make the working quite clear. This is an ingenious method of power transmission. The limitation to one dynamo, and one motor, argues well for good efficiency.

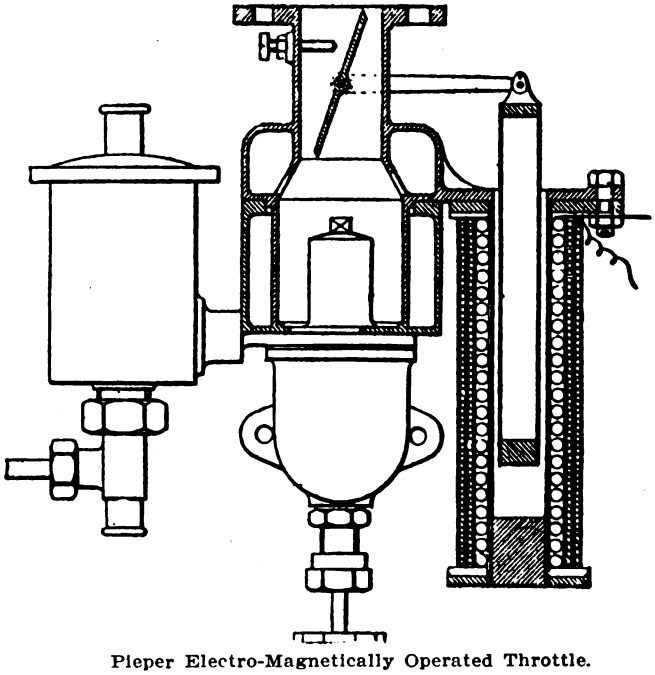
The Pieper System

It will be observed that in this system there is a single dynamotor, and that a battery of accumulators is retained. There is, also, a fairly good application of the electro-magnetic clutch for the transmission of the power at various speeds to the bevel drive on the back axle. A gasoline engine drives, direct coupled, a shunt-wound dynamotor, which is connected through a controller to the battery of accumulators, the dynamotor working as a motor, or dynamo, according as its E. M. F. is inferior or superior to that of the battery; in fact, the dynamotor can yield additional power to assist propulsion, say, when climbing gradients. The battery is utilized for ignition purposes, and for running the dynamotor as a motor for starting the engine. The current from the cells regulates also the gas supply to the engine, for which the armature of the dynamotor and the magnetic field of the clutch forms a flywheel. The dynamotor is fitted with commutating poles: the windings of these are connected in series with the armature, thus ensuring good commutation with heavy currents, and with a weak main field, which is an advantage. Whether the road shocks have any effect in causing chattering at the brushes, or their jumping off the commutator, and thus causing sparking and wear and tear at that point, remains to be seen.

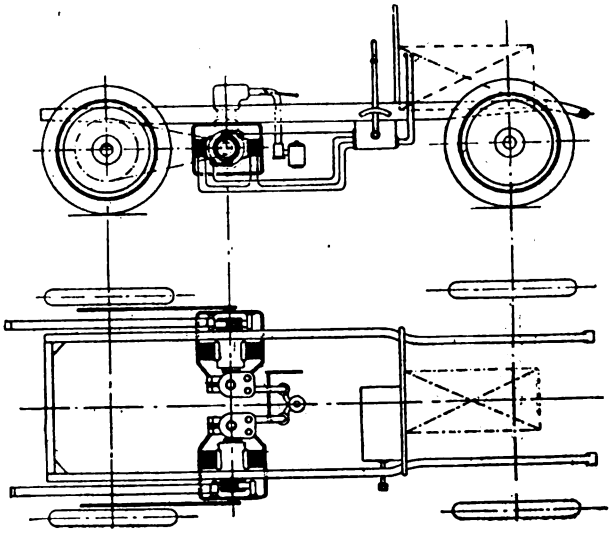
As before stated, the gas to the engine is controlled by the demand for current from the cells; the controlling solenoid is differentially wound, so that during starting and the period of extra effort the discharge current traversing its series-winding decreases the magnetism produced by the shunt-winding, which, in turn, increases the admission of the gases, and thus compels the engine to give its maximum power for a given number of r. p. m. If, on the contrary, it is a charging current from the dynamotor



The Pieper Chassis.



Pieper Electro-Magnetically Operated Throttle.



A Late Pieper Design.

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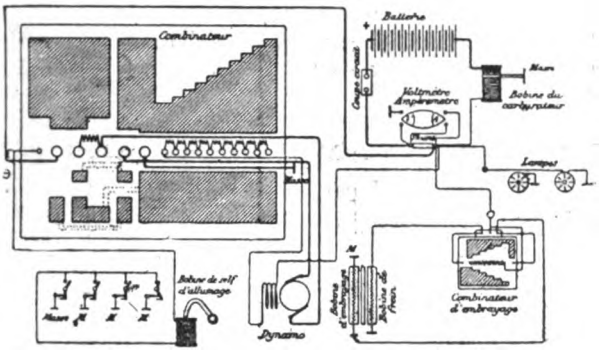
to the cells, the action of the series-winding assists that of the shunt-winding, and tends to close the throttle. The fact that the engine and dynamotor are direct coupled always with the magnetic clutch goes to prove that the car is always on direct drive. This is interesting, and indicates that the car must climb a hill at top speed; the power of the engine will, otherwise, fall with the speed of the car, and the battery will, owing to the consequent lower back E. M. F. from the dynamotor, be called on to supply a very heavy current. Further, the P. D. at the battery terminals must also fall, because of the increased discharge.



Pieper Wiring System.

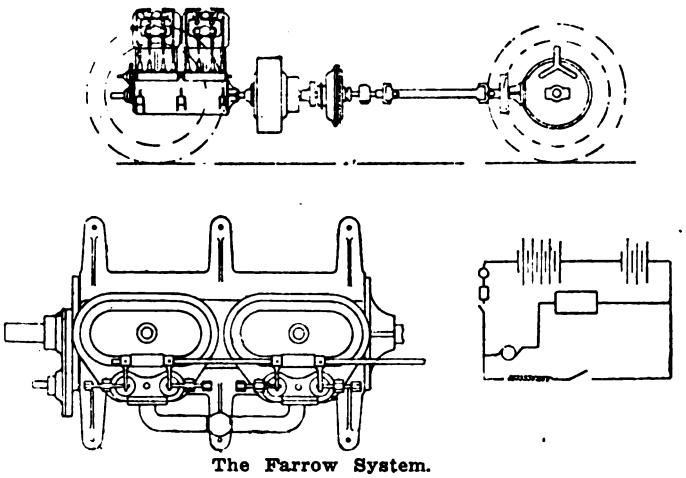
It is, therefore, quite clear that although considerable variation in speed can be obtained on light loads, the engine must be of sufficient power, after allowance for the available power from the dynamotor at top speed, to do the maximum work on direct drive, i. e., climbing a gradient at top speed, as no change of electrical gear, such as series-parallel connecting, is, evidently, provided for. Again, the expected saving in gasoline consumption on heavy vehicles may be very small, owing to the fact that the input to the battery in descending a hill is smaller than the output in ascending, say, the same hill. The difference must be made good by burning gasoline in charging the battery to its normal condition again, in addition to providing the necessary power for propulsion on level roads. The fact of stopping the engine's firing when descending a hill, or stopping the car when taking up a passenger, will not, in our opinion, be commercially good, and a direct-acting system of electric power transmission, with electrical speed and torque variation, will, in the end, turn out best.

It is sometime apparently necessary to apply full power on the reverse, say, in backing up an incline, or out of a rut. It will, perhaps, be observed that the dynamotor has to draw current to accomplish this on direct drive, as well as to turn the engine backwards, and considerable loss must take place in the resistance then used in the armature circuit. The ignition system used is simple and, in our opinion, good. It consists of low-tension "make and break" contacts, one in each cylinder, which are set a little later than full compression for starting. What amounts to an advance of the ignition point takes place by increasing the self-induction in the primary induction coil, by insertion of an iron core, this increasing the intensity of the spark, which fires the gas more quickly at the higher speeds. A similar system is used on stationary gas engines for electric lighting, with very satisfactory results.

The Pieper system, is a most interesting and, from an electrical aspect, a most scientific aplication, and will no doubt find a good field of employment when it has been suitably modified.

The Farrow System

It will be of more than passing interest to notice how closely this earlier British system resembles the Pieper in constructional details. The engine, dynamo, accumulators, and magnetic clutch being retained, an important and practical feature is that when descending a hill, or when running on the reverse, an arrangement is provided so that the compression is taken off the cylinder and the throttle is totally closed; this economizes gasoline and, at the same time, when descending a hill, a correspondingly larger charge can, by partly taking off the braking effect of the compression, be sent to the battery, and, for that reason alone must tend toward economy. When starting the engine current is taken from the cells for driving the dynamotor.

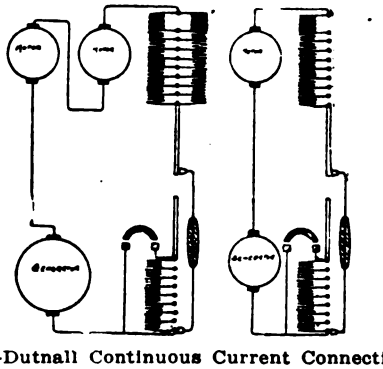


The Farrow System.

When some speed has been attained, if the dynamotor is started without excitation of the clutch, the latter is let in and the car is then started. The engine now drives the car unaided, or, if on an incline, the assistance of the dynamotor with current from the accumulators is available. The car apparently has also all the advantages claimed for the Pieper system. However, from the electrical point of view, it is a thoroughly good piece of transmission apparatus.

The Hart-Durtnall System

It will have been noticed that all the systems previously dealt with are systems utilizing continuous current, and this for reasons which will later be explained. We have brought out a system of power transmission in which polyphase alternating-current apparatus is adopted. One of the principle things which



Hart-Dutnall Continuous Current Connections.

led us in that direction was that considerable trouble and unreliability were experienced by us when transmitting high power with continuous current apparatus. Electrical engineers generally will admit that the polyphase, alternating current induction motor has become very popular recently for stationary work, mainly owing to its powerful starting torque and to its freedom from commutator and brush troubles. A burnt-out armature, the perpetual source of dread in continuous-current dynamos and motors, is practically unknown in the polyphase, alternating current, induction type, even when put to most severe service, and its depreciation under fair conditions is as low as any class of rotating machinery, while its simple and substantial construction is one of the chief advantages, resulting in low cost of maintenance and attendance. Observe, too, how it differs from the single-phase, alternating-current induction motor, which has the disadvantage that it is unable to start against load. The single-phase type is also less flexible as regards speed, but in other re-

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spects the singlephase type is similar to the polyphase, alternating-current, induction motor.

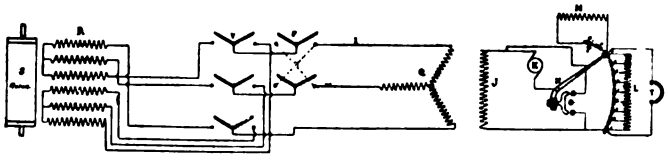
It has been stated that the induction motor is not flexible in respect to regulation of speed, but there are several methods of obtaining a variation of speed with polyphase induction motors. One method is the insertion of a resistance in the "rotor" circuit, but that wastes power, as do all motors using resistance in their armature circuits. Another is the variation of the voltage of the alternating current to the "stator," thus causing more or less slip.

A third method is by changing the number of poles of the "stator," and so arranging them that although the periodicity of the supply current remains constant the motor can turn at, say, one-quarter, one-half, or full speed. This result is very similar in action to, though, in fact, very much more flexible than, an ordinary set of change-speed gears. You will observe that the main current, at full pressure, simply passes through the "stator" windings, which are quite enclosed, the current not traversing any exposed part such as a commutator, brushes, etc., and, as these windings are *stationary,* there is no danger of mechanical injury. The insulation of the "stator" can be made very secure, as it is not rotated, and can, therefore, stand a varying voltage better than would be permissible with a continuous-current motor.

The most important item in favor of the induction motor is the revolving part, or "rotor;" in this only low voltages are generated, and consequently very little insulation is required. The continuous-current motor requires a commutator to convert the current into an alternating one as it enters the windings of the armature; this fact necessitates the use of brushes for a rubbing contact, and these require a deal of attention from time to time for trimming and adjustment, while the commutator occasionally requires turning up, and this pretty often if there is any sparking, which is very liable to occur, especially if the motors have to be cut down in weight, as have all automobile motors.

Polyphase induction motors do not require any commutator, and are free from that very expensive and, at the best, very undesirable part.

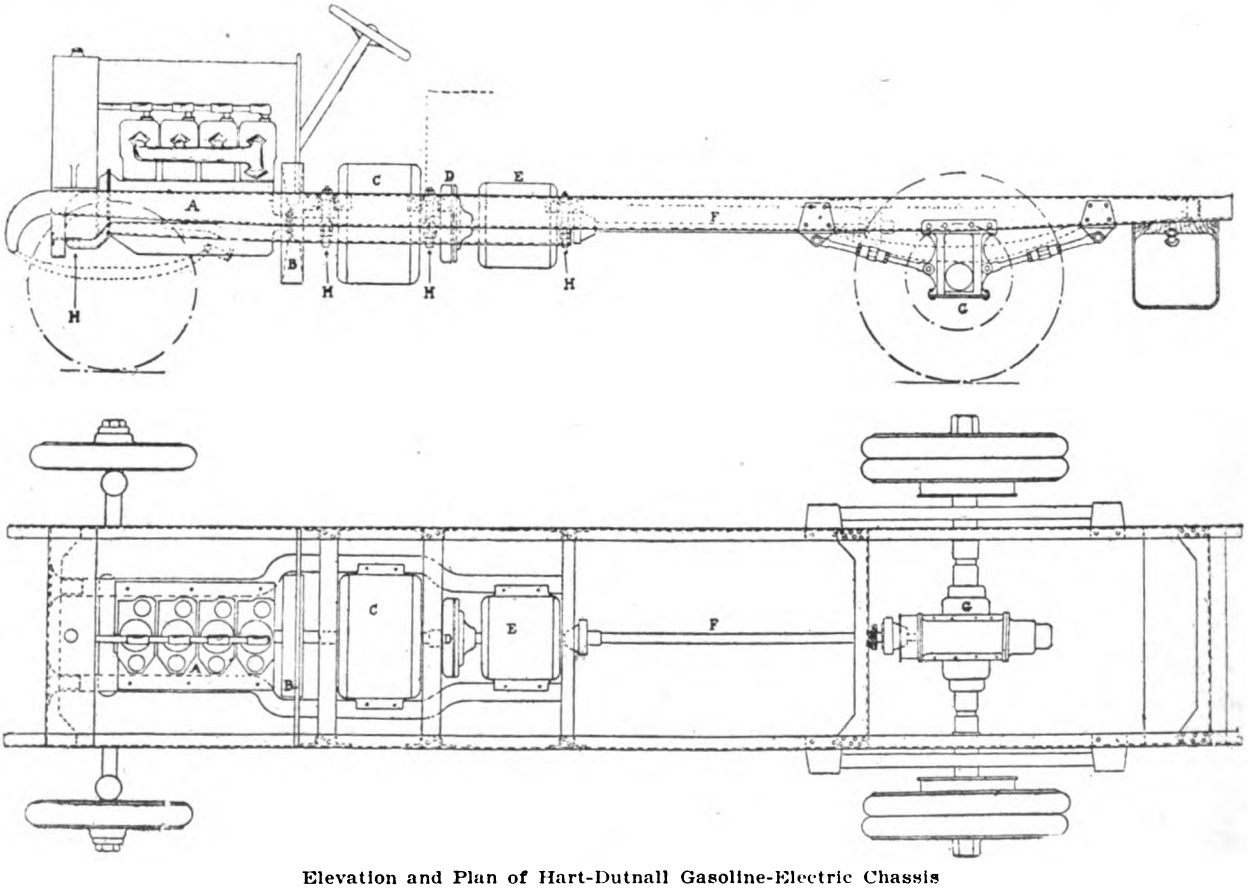
With polyphase induction motors, and especially if fitted with short-circuited "rotors," there is absolutely no chance of sparking. The dimensions and weights are smaller, power for power, than those of continuous-current motors. Owing to their simplicity, polyphase induction motors are more suitable to be left in the hands of ordinary drivers, or of unskilled workmen. It is an important fact that, if a polyphase induction motor is driven independently, above synchronism, it becomes a generator and an absorber of mechanical power; the effect of this feature is emphasized later. The important part this quality will take in the economical running of vehicles is only one of many advantages of this method of transmission, and one which will become fully apparent when more trials have been completed.



Hart-Dutnall Connections.

We show, diagrammatically, a general arrangement, in plan and elevation, of the Hart-Durtnall chassis. The car has been run on the road with gratifying results. A is a 40 hp. engine (speed 800 r. p. m.); B, fan; C, polyphase, alternating current generator, combined with a series-wound exciter; D, electromagnetic clutch, to obtain direct drive on top speed (800 r. p. m. of engine equals 12 m. p. h.); E, polyphase, alternating current, induction motor, coupled direct by means of—F, propeller-shaft, fitted with universal compensating joints to—G, live back axle, fitted with differential gear, etc.; and H, bolts to carry the whole plant, which is slung from the cross members of the chassis.

It will be noticed that by undoing the universal joint and the supporting lugs, water and gasoline connections, etc., the complete set of machinery can be lowered from the chassis for examination or possible repairs. A complete spare set can very



Elevation and Plan of Hart-Dutnall Gasoline-Electric Chassis

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easily take the place of the set under repair; hence keeping the vehicle constantly on the road.

Other parts shown in the diagram are: I, connections; J, exciting revolving field magnet of polyphase current generator; K, armature of small continuous-current, series-wound exciter; L, sectional field of exciter; M, winding of electro-magnetic clutch; N, regulating switch and contacts in connection with sectional field; O, bridge contact piece for short-circuiting generator field; P, contacts for bringing into circuit magnetic clutch windings; Q, fixed armature winding in polyphase generator; R, fixed "stator" two-speed windings; S, "rotor" of polyphase motor, with short circuited bar windings; T, bridge contact in connection with the foot brake pedal; U, reversing switch; V, two-speed switch for starting on gradients.

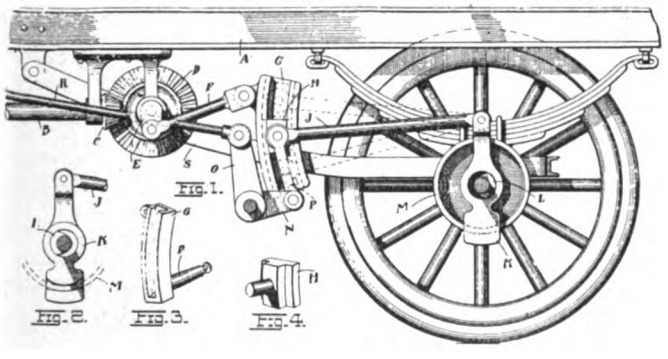
The method of operation is as follows: assuming the engine is runing at constant speed, the switch is on the forward position, the two-speed switch is on the top electrical driving speed and the regulating switch is on position 1, no voltage being available, the driver places the switch on No. 2 contact and a low voltage is generated which excites the alternator field, which in turn generates polyphase alternating current in the generator armature winding, whence it is conducted by copper bars through the reverse and two speed switches to the "stator" winding in the motor, producing a rotating field in the "stator." The "rotor" then starts and endeavors to get into speed with the generator. Should the vehicle be loaded it may be necessary to increase the field of the exciter in order to get sufficient starting torque at the motor. This is done by bringing the switch around to No. 9 contact. When the speed of the car has risen direct drive is obtained by moving the switch on to No. 10 contact. This move drops the magnetic clutch winding in series with the field of the generator, weakening this field and at the same time gently brings over the clutch into contact. The last move, to No. 11 contact, which is made immediately, causes the insulated bridge piece to short circuit the polyphase generator field. It will be observed that the exciter then only supplies current to the magnetic clutch winding, which grips solid, and the direct drive on top speed, from engine to rear axle, is obtained.

Should it be necessary to stop on a very steep ascent the driver, in order to restart, puts his two-speed switch in the low-speed position; the engine then runs at top speed and the car at low speed, with increased torque at the rear wheels. In stopping sharply at speed the bridge contact is so arranged that the exciter field is short circuited before the band brakes are applied, and when the road is clear again the exciter does not pick up again until the driver takes his foot off the brake pedal.

THE CUSTEAD TRANSMISSION

PERHAPS the best evidence concerning the merit of the transmission invented by W. D. Custead, of New York City, is the daily record of a 3-ton truck to which it has been fitted since December 19th, 1905. This vehicle fitted with 16 hp. engine, upon occasion hauls 7,500 pounds of merchandise up a 20 per cent grade. Its regular service is quite satisfactory, the transmission proving economical, effective and durable.

The drawings will serve to explain the principle and operation of the transmission. Figure 1 for convenience shows the frame, spring and wheel of the far side of the vehicle. Figure 2 is one of the grips, Figure 3 one of the links and Figure 4 one of the movable fulcrums. A is the frame, B the drive shaft from motor, C and D bevel gears which operate a short crank-shaft, E, connected by



rods, F, to oscillating links, G, which carry movable fulcrums, H, controlled by P and operating, by rods J, the grips K—controlled by cushioned eccentric L—and operating drums, M, affixed to driven shaft or axle of vehicle. N and O are mounted on a cross-shaft and govern position of the movable fulcrum and, hence, the speed of the vehicle. When this movable fulcrum is at bottom of oscillating link G, or opposite its axis, no motion is imparted to rod J, but when moved upwards, or above such axis, motion is imparted to grips K and hence the wheels to whatever degree of power or speed desired.

The eccentric is cushioned in such a manner that there is no noise or lost motion in the grips. When this eccentric is straight up, it acts as an axis in both directions on which the grip rides freely, so that grips do not engage drums at all; but when this eccentric is in position, as shown in Figure 1, the grips are free to act backward, but not forward, unless eccentric is turned to opposite side of grip, when their action is reversed. Cranks are set opposite, so that one grip is always pulling. Eccentrics are controlled by a foot-lever, while speed is controlled by a hand-lever that remains in any position desired. The grips act as an emergency brake in either direction. Car can not run backward unless eccentrics are reversed.

The transmission is especially adapted to commercial vehicles of any load capacity.

The Roosevelt Auto Company has been formed in Roosevelt, N. J., to operate a motor bus line between Rahway and Boynton Beach. The company has purchased the three buses formerly owned and operated by the East Jersey Motor and Transportation Company, and is fitting them up for service. The line will be operated on a regular schedule, and will give quick transportation to the Boynton Beach pleasure grounds.

Motor bus service will soon be inaugurated between Marion, Ind., and the Soldiers' Home, some miles distant. Two vehicles, fitted with 24 hp. two-cycle engines will be put in operation in the spring.

In Baltimore there is some talk of forming a company for the purpose of operating a line of motor buses between the hotels, railroad stations and neighboring pleasure resorts.

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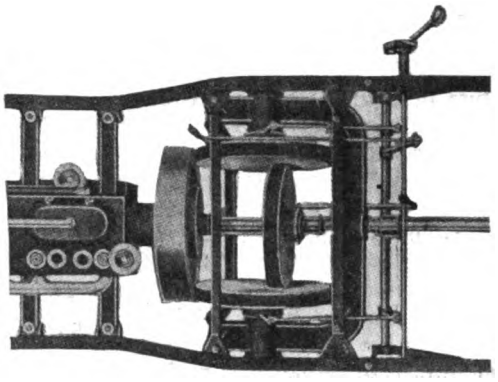
The Truck That Made The Journey.



The Transmission Employed.

Long-Distance Winter Trucking

Remarkable Performance of a Two-Ton Truck Fitted With Friction Transmission

LAST month a 2-ton gasoline truck traveled from Detroit to Chicago, a distance of more than 300 miles, without mishap of any kind, over roads which were alternately smothered with snow and covered with ice. The performance indicated the possibilities of long-distance motor trucking, even under the most adverse conditions of road and weather, particularly marking the profitable character of such work if undertaken by people competent to guide it to success.

The truck in question was one from the stock of the Reliance Motor Car Company, of Detroit, equipped with friction transmission made by the Gearless Transmission Company, and carrying a 1½-ton load. The vehicle carried Andrew Bechle, driver; George F. Day, sales agent of the Reliance company; George D. Wilcox, manager of the Gearless Transmission Company and O. W. Davis, inventor of the transmission, together with its own supply of gasoline, oil and other dead weight. It left Detroit at noon on January 26 and reached Chicago at noon four days later, averaging about 75 miles a day. As the journey drew to a close much snow was encountered, at times covering the wheel hubs. At one point the front wheels plunged into a snowdrift, and had it not been for the lengths of logging chain wrapped around the rear wheel tires it would have been impossible to make further progress.

The actual running time was 33 hours and 49 minutes, in which is included time spent each day in inspecting the truck prior to setting out at the beginning of each stage of the journey. The average speed maintained on the road, therefore, was about nine miles per hour. As the truck is geared for maximum speed of fifteen miles an hour, it was occasionally possible to make fairly rapid progress, upon one occasion a speed of thirteen miles an hour being maintained for three consecutive hours. The stopping points were Ypsilanti, Coldwater, South Bend, Hobart and from thence to Chicago. The run from Ypsilanti to Coldwater was the most trying of the entire journey, the roads containing many hills varying in grade from 5 to 12 per cent.

Some idea of the severity of the road conditions may be gained from the fact that before Chicago was reached the chains used to afford traction for the rear wheels had been worn through four times. The tires themselves however, although naturally showing considerable wear after such arduous duty, were highly presentable at the end of the trip and were apparently more damaged by the chains than by friction at the frozen road surface. The truck was fitted with Firestone side wire tires.

Further than oiling, replenishing the fuel tank, and soldering a leak in it, no attention was given to the truck. Not a single adjustment was made in the motor from beginning to end of the journey. The friction transmission required no attention.

As operating costs of enterprises of this kind are always of interest—though the deductions which can safely be made from them are not capable of being widely applied—the running expenses of the journey are herewith appended:

58 gals. gasoline at 13c per gal.....	$7.54
3 gals. lubricating oil at 38c per gal.....	1.05
Driver's wages at $2 per day.....	8.00
Total operating expense	$16.59

These figures, of course, represent bare operating costs, no calculation being made for depreciation and repairs which would naturally have to be figured in estimating upon the constancy of such service.

As the actual load was 3,300 lbs., the cost for the journey works out at 3 1-3c per ton mile.

The friction transmission which played such a conspicuous part in this remarkable performance is a highly interesting bit of mechanism which, although illustrated and described in this paper ten months ago, is of sufficient importance to be described again. Conspicuous among its advantages are power economy when driving

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direct, simplicity, noiselessness, availability as a brake, durability, accessibility, and immunity from injury. Trucks to which it is fitted start without jerking and consequently escape the attendant strain on running gear. It is a direct drive on the high gear, the two side wheels not being at that time connected with the flywheel, nor are they connected with the central driving wheel, splined to the mainshaft. The wheels above referred to do not rotate at that time and cease to be a moving part of the transmission. This allows the entire power to be delivered direct to the driving wheels of the wagon. When necessary to change the speed for either hill-climbing or in reversing, the two side wheels are brought into contact with the engine flywheel and the central wheel, by means of a foot lever, and the direct clutch in the engine flywheel is automatically withdrawn. Through the use of the side lever the central transmission wheel, splined to the mainshaft, is adjusted on that shaft to any desired position from the centers to the rims of the side wheels. The perfect alignment of the driving shaft is not altered in any way by the fact that the side wheels are thrown into contact with its central driving wheel through the operation of the foot lever. The two side wheels are thrown into contact in unison, the thrust of one compensating that of the other, and the extra thrust on both wheels being absorbed by suitable roller bearing thrust journals incorporated in the hubs of the two side wheels.

Each of the side wheels driven in an opposite direction, as they engage diametrically opposite points on the rim of the flywheel; and as the central driving wheel in turn is engaged by both inner surfaces of the side wheels, it will be seen that the power is delivered to it from diametrically opposite points, thus eliminating any side thrusts on the driving shaft.

When it is desired to back the wagon, the central driving wheel is shifted aft of the center of the side wheels. This accomplishes the purpose of reversing the central driving wheel and rotating the shaft in the opposite direction.

The frame of the transmission is suspended at four points by means of bolts from cross members attached to the frame of the wagon. Levers projecting from the sleeves on the inner side of the hub bearings are operated in unison from a foot pedal to bring the side wheels into contact with the engine flywheel and the central wheel on the shaft simultaneously. The shifter rod connected to the central wheel is operated from the side lever and adjusts the central wheel on the shaft to that point on the side wheels to obtain the desired speed.

The transmission can be used not only as the regular operating brake of the car but also as a powerful emergency brake.

The friction surfaces used in the transmission are the result of years of experimental work and are securely bolted on the periphery of all friction wheels and are guaranteed for one year. The friction surfaces have withstood 5,000 miles usage without showing any appreciable wear.

The final drive of the Reliance truck is by side chains from jack shaft to rear wheels. The front axle is a heavy forging of I-beam pattern, with 2-inch spindles fitted with roller bearings. The frame is of pressed steel. Four-inch solid tires are fitted to all wheels which are 32 inches in diameter. The foot operated brake clamps on outside of rear wheel drums. Emergency brake, hand-operated, expands against inner brake drum on rear wheels.. Wheel base is 108 inches; tread, standard. The fuel tank has capacity for 22 gallons. The chief features of Reliance trucks are their ample power, simplicity of design, quality of materials and ease of control. The two cycle motor has but five working parts—pistons, connecting rods and crank shaft. It has no valves, springs, cams, cam shafts, gears, push rods or other delicate parts. It gets an impulse in each of its two cylinders at each revolution of the fly wheel.

MOTOR MAIL SERVICE IN AUSTRALIA

WHILE in Europe attending the international postal congress the postmaster general of Australia became acquainted with the manner in which Great Britain, France, Italy and other countries were making an increased use of motor traction. He returned to Australia strongly impressed with the possibility of motor conveyance in the commonwealth, one of his first acts being to ascertain how far the motor car could be used as a means of clearing pillar letter boxes in the large centers of population.

He states that in all the experiments made by federal and state departments the primary mistake has consisted in regarding speed, rather than utility, as the great recommendation. He has hinted that the federal postal administration will have to make an extensive use of the motor car for postal purposes, in spite of the opposition displayed by the various railways. The idea is that cars running at about fifteen miles an hour, carrying mails, passengers and freight, might be employed in the rural districts, the profits assisting in defraying the cost and thus preparing the way for the introduction of the penny postage system throughout the commonwealth.

ECONOMIZING ELECTRIC VEHICLE POWER

A good driver of electric vehicles will endeavor to be economical with his power. With the same power and under the same conditions, a careful driver will get from eight to twelve miles more from one charge of the battery than will one who does not save his power at every opportunity. The second speed is the most economical, though the motor is not quite as efficient when operated under the third speed of a three speed controller or fourth speed of a four speed controller. With the controller in the second notch, the vehicle will run farther than if in any other. With the controller in the first notch, nearly the same amount of current is used as in the second, but part of it is wasted in the resistance coils under the body of the vehicle. Hence, the first speed is the least economical of all. When intending to stop at a given point, it saves power if the current is cut off and the vehicle allowed to coast, and all hills that are not too steep may be coasted without brake.

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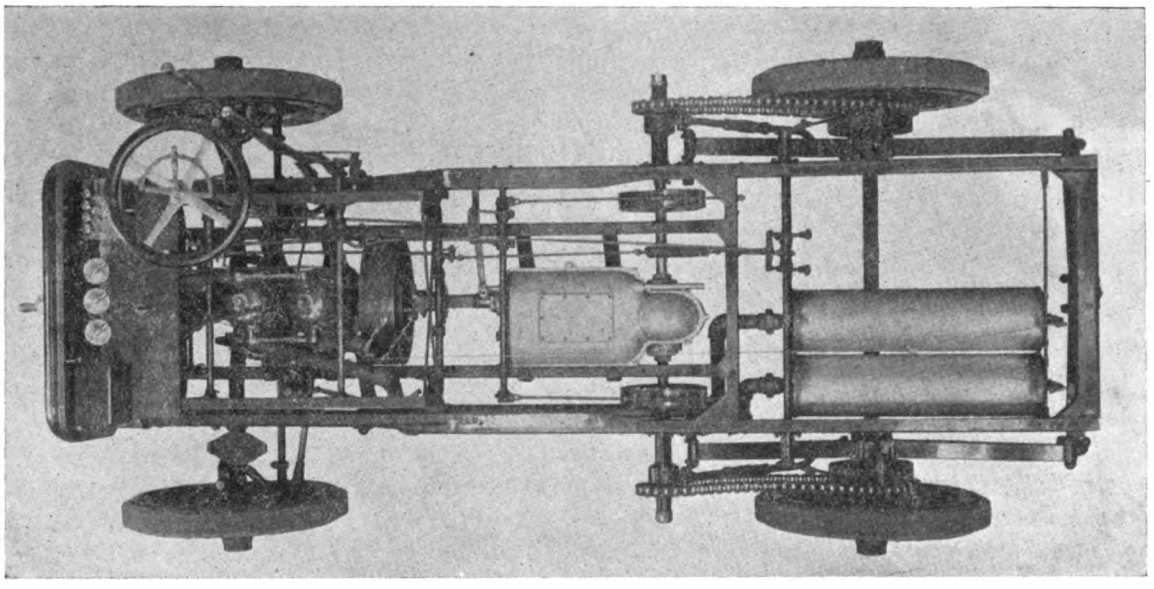

Chassis of the Coppock Truck.

The Coppock Truck

Description of a New Vehicle Fitted With an Improved Form of Two-Cycle Engine

A VERY interesting one-ton truck, fitted with two cylinder, two cycle gasoline engine is being made in Marion, Ind., by the Coppock Motor Car Company. The chassis of the vehicle is interchangeable for sight-seeing or bus purposes. This is the sixth concern to pronounce in favor of the simplified two-cycle engine. Its example is certain to be widely copied before long if the rumors one hears of manufacturing intentions are not exaggerated.

The engine of the wagon is of the three port type, with vertical cylinders separately cast. The bore is 4½ inches and the stroke 5 inches. The cylinders are machined on the outer surface to maintain perfect roundness under all conditions, even cylinder wall thickness insuring even expansion and contraction. The 16-ounce spun copper water jackets are held in place by a special hexagon bronze nut at the top and a spanner nut of the same material at the bottom, allowing easy access for cleaning the jacket. The weight of each cylinder, without jacket, is 16½ pounds.

The lubrication of pistons and connecting rod is positive by force feed oiler gear driven in the following manner: One oil pipe leads to a boss on the side of the cylinder, leading to a groove on inside of cylinder 3-16 nches wide and 1-8 inch deep. This groove is cut from one side of piston pin, extending around to the opposite side. In this manner it entirely surrounds the piston except the width of the pin, which is 1 1-8 inches. On the movement of the piston this groove is not uncovered, but comes to 1-8 inch of each end of the piston on its up and down stroke. In this manner the piston and rings are always well lubricated, with absolutely no waste of oil. For the lubrication of the connecting rod the piston pin is hollow two-thirds of the way through. The second oil lead registers with this hollow end. The piston pin is drilled, so that when the crank is in vertical position oil is fed to the upper end of the rod. When the crank is in horizontal position the oil hole is drilled in pin to register with the tube fastened in the channel of the connecting rod, which leads to its lower end. After the car was in service for two months the lower crank case was drained to see what quantity of oil was wasted, and less than one ounce was found in each compartment.

The crank journals are fed by hard grease cups placed upon the dash in plain view of operator, and lead to engine in 3-8 inch copper tubing. The great advantage of these cups on dash are: First, operator will not neglect them as they are always in sight; second, they are away from heat of the engine, and the grease will always remain in firm condition.

Piston rings are the Cartwright steam packing pattern. The outer ring is 5-8 inches wide, 1-8 inch thick, split at 45 degrees. Two rings under this master ring are 3-16 x 1-8 inches, eccentric 5-16 inches wide. All rings are pinned by one pin passing through the lap of the master ring, and between the two eccentric rings. There is an allowance made of 1-16 inches in depth of ring groove over the two ring thickness for lubrication. With this arrangement of the rings and lubrication, after exhaustive tests were made, no signs of carbon deposit in ring grooves were shown, which is so common with 2 cycle motors.

Crank case is made from special aluminum alloy, the lower half being made in two pieces flanged together in center to allow adjustment to be made on either rod without the crank shaft dropping out during such operation.

Bearings on crank shaft are babbitt and bronze. The outer bronze shell has 24 studs cast with it, which extend through the babbitt lining. Babbitt metal is put in these shells by hydraulic pressure so as to secure the

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best wearing surface which is afterwards machined to size. This method secures an even surface of babbitt and bronze for the bearings. The bearings are three in number, and each is 4 inches long.

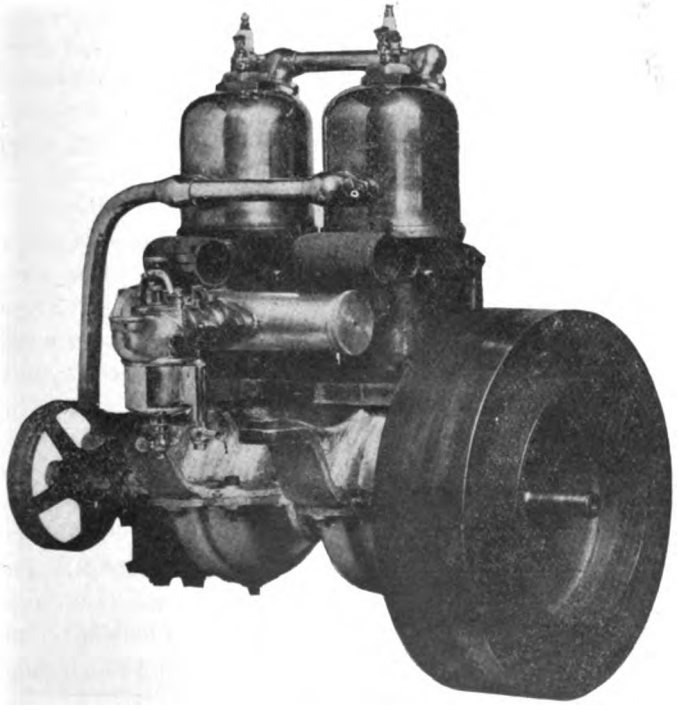
The crankshaft is 30-point carbon steel, hand-forged, carrying a 5½-inch flange for bolting on the balance wheel. It is finished all over, the main journals being ground to size. The bearings in the lower end of the connecting rods are split in the usual manner, but they overlap each side of the rod the same as in steam engine practice with wrist pin bearings. They are pinned with a 3-16 inch pin in each half to keep from rotating in the rod end. These dowel pin holes in all bearings are drilled with special jigs so as to insure perfect fitting for renewals.

The commutator and pump are driven from one set of spiral gears made of nickel steel and hardened. The commutator shaft is mounted on three ball bearings. The gears are encased on front of the engine shaft in a bronze housing which is filled with grease. The pump for water circulation is of the standard gear type with ⅜ inch inlet and outlet openings.

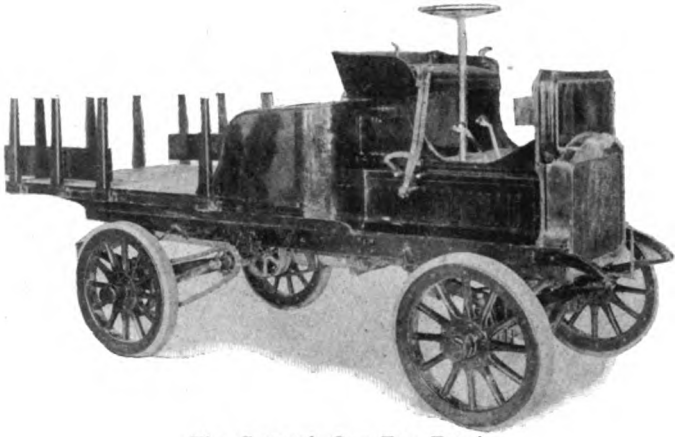
Cooling is by vertical tube radiator carrying 176 feet of tubing, assisted by a four blade fan. A neat belt adjuster is achieved by threading the standard carrying the fan into its supporting bracket and using nut and locknut for retaining it in any desired position.

The expanding bronze ring clutch acts within the small diameter drum on the rear face of the flywheel. This drum has a diameter of 10 inches and a width of 2¼ inches. To insure gradual clutch engagement with an absence of gripping a series of cork inserts is used in the bronze band, these cork portions forming 8 per cent of the band surface.

The frame is made of 11-64 nickel steel, cold pressed. The front springs are 40 inches long, 8 leaves 2 inches wide. The rear side springs are 48 inches long, 8 leaves 2¼ inches wide. The rear cross spring is 38 inches long, with 8 leaves.



Two Cycle Engine of the Coppock Truck.



The Coppock One Ton Truck.

The front axle is of 1¾ inch I-beam pattern. The bed is of forged nickel steel. The rear axle is a 1¾ inch nickel steel forging. Both axles are fitted with roller bearings.

The steering gear is of worm and sector type, with spark and throttle control on top of hand wheel. The transmission, of progressive spur gear type, gives three forward speeds. The gears are formed of hardened nickel steel and made with 1-inch face and six pitch. The bevels for transmitting to the jackshaft are made from the same metal but have four pitch. Final drive is by means of two side chains from jackshaft to rear wheels.

The wheel base is 87 inches. All wheels are 32 inches diameter. Front wheels are fitted with 3½ inch solid tires, rear wheels with 4 inch tires. Brakes of external band type are carried on the cross countershaft. Two brakes are also carried on the rear wheel hubs.

While at present the Coppock Company is only making a one-ton wagon it expects soon to manufacture a truck with 3-ton capacity.

The officers of the company are as follows: President, M. Earl Brackett; vice president, W. M. Myers; secretary, H. F. Reynolds; treasurer, Harry Ward; general superintendent, L. W. Coppock. The president and treasurer of the company are well known as the chief executive officers of the Ward Fence Company, of Marion.

MOTOR LIVERY SERVICE

A liveryman in Chicago, Owen H. Fay by name, doing an extensive business, became interested a short time ago in the sale of touring cars and by an easy process of transition is now using motor cars wherever he formerly employed horses. Twenty-five machines have been purchased. As the Fay livery has the lucrative patronage of the two Auditorium hotels, the prospect of doing a thriving business with motor cars appears to be very good. Premises have been leased on Michigan avenue, adjacent to the hotels, and every effort will be put forth to secure patronage. The machine which the Fay livery are using are fitted with 2 cycle engines.

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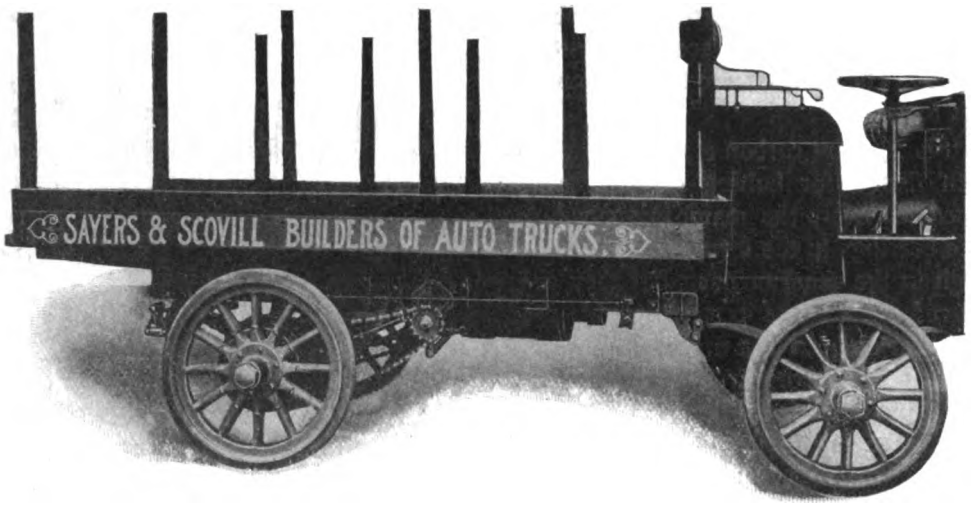

Sayers & Scovill's Truck

Description of 1½ Ton Gasoline Vehicle Fitted With Air Cooled Engine

A ONE and a half-ton gasoline truck, possessing many admirable features of construction, is being built in Cincinnati by Sayers & Scovill. The motor, of 25 hp., is placed under the footboard so as to fully expose it for daily inspection, without interfering with the load platform. The air-cooling of the cylinder is so perfect that the motor almost invariably starts from the spark without cranking, there being no carbon deposits. The motor will run continuously, as the cylinders are perfectly round, no lug or hole of any kind being drilled around their exterior surface, thereby giving a uniform circular expansion, which can never bind the piston. The cooling fins are 2-inches deep and ⅛ inch thick at the base, tapering to 1-16 inch. These fins are ground to a true circle. The cylinders are made of composition metal, especially adapted to air-cooled work, and are run through a hardening process and finished by grinding to standard gauge.

The tread is 60 inches; wheel base is 96 inches; weight of chassis is 2,600 pounds; standard speed is 18 miles an hour. The front tires are 3½ x 32 inch; the rear tires are 3½ x 34 inch.

The mechanically operated interchangeable valve parts are hardened throughout. One of the important features in air-cooling is to keep a perfect compression through the valves. The valve cages and valve seats are not pocketed down in the cylinder, but are set on top and have an extremely large air-cooling area. Valve and valve stem are of the two-piece construction.

The crank shaft is hardened and finished by grinding to 1¾-inch diameter, and is accurately balanced. The flywheel is fastened with six ¾-inch collar bolts to a flange integral with the crank shaft, the 1¼-inch end of shaft, for centering the clutch, is also integral with crank shaft.

The crank case is of special aluminum alloy. At the highest speed of the engine there is not a drop of oil leaving the crank case at any point; also the displacement of air from the rapidly moving piston is taken care of, there being little pressure or vacuum passing through the air ducts. The cam shaft and lower half of crank case may be removed without disturbing the other parts of the engine.

The lubrication is of the 4-feed shooting piston type, and has a separate pump for each feed; no screws are used internally. The oiler is enclosed and has all working parts submerged in oil. It is positive ratchet driven, no belts used, and forces the oil at a pressure of 75 pounds, in a quantity which varies according to the speed of the engine.

The transmission is the well known sliding gear, three speeds forward and one reverse. The gears are of special high-grade nickel steel, hardened and flange bolted to shafts. The drive is direct on high. The differential is integral with transmission, and revolves on roller bearings. The 1½-inch side shaft outer bearings revolve on large annular ball bearings, situated within 1-16 inch of the sprocket. These ball bearings are enclosed in a manganese bronze casting, which is directly connected with the radius rod; thus the strain produced by the chain and radius rod is taken care of without putting the strain on the frame.

The clutch is of the internal expansion type. The heavy springs usually used are entirely eliminated, making it easy for the operator who uses the clutch very frequently on a truck. It revolves on a roller-bearing. The end thrust is very light, but even so, this thrust is not put into the crank bearings of the engine. It is transmitted against a roller-bearing, putting thrust directly on the frame. This clutch has very few parts, and can be dismounted quickly by the inexperienced. With the clutch it is possible to start a 3,000-lb. load directly on high gear, and the truck can be run at a very low speed on high gear. The metal used in its entire construction is manganese bronze. The power is transmitted to the univarsal joints by a large flange, using six 20 per cent carbon ½-inch bolts.

The steering gear is irreversible, with 16-inch hand wheel, operated by worm and nut, and requires two turns

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from right to left. No side levers are used. The small self-finding gear shift lever is situated under the hand wheel, thus enabling the operator to shift the gear without changing his natural vertical position. Two pedals are used, the outer pedal first disengages the clutch and then applies the emergency brake; the inner pedal first disengages the clutch and then applies the light running brakes. The spark and throttle levers are situated in center of hand wheel, the segment always remaining stationary. It will be noticed from the above description that all complications of control are discarded and an inexperienced operator can quickly pick up this system.

The frame is constructed of 2x5-inch ash, armored by ¼ x 5-inch steel. The sub-frames are hot riveted in position. The front corner of frame is connected by a steel casting which also serves as a spring hanger.

Two independent sets of brakes are used. They are of the contracting band type. The regular light running brakes are of such size as to prolong the life of the tires, which is an important factor. They are situated on the side shaft, and as their adjustment can not be affected by the radius rod, they always remain the same. The emergency brakes (2½ inches face and 16 inches in diameter) are on the hubs of rear sprockets. The twisting action produced by the emergency brake is transmitted to the radius rod, thereby relieving the springs of this strain. Both sets of brakes have long equalizers. No cables are used.

The wheels are second-growth hickory, spokes 2 inches thick on front and 2¼ inches thick on rear wheels. The driving sprockets on rear wheels serve as the inner hub flange, and are fastened by six ⅝-inch bolts in center, and twelve ⅜-inch bolts around the outside of flange; these bolts passing through the spokes, and with a special head to prevent spokes from splitting.

The interchangeable sprockets are cut for ⅝ x 1¼-inch roller chain. Side chain drive.

Radius rod is a steel casting, and acts as a shock absorber. A ratchet sprag is provided.

There are two especially designed universal joints between engine and transmission. They are dust-proof, and can be taken apart quickly without the aid of tools.

The springs are half-elliptic front, 2¼ inches wide, 42 inches centers. The rear springs are platform, 2½ inches wide, 42 inches centers; cross springs 2½ inches wide and 38 inches centers.

The front axle is of 2½-inch I-beam construction and does not require the usual bend in center, giving greater road clearance. The rear axle is stationary, and is 2¼ inch solid square. Axles have roller bearings.

AUTOMOBILE FIRE APPARATUS

THE days of the fire department horses in Cleveland are numbered. Automobiles will take their places. The change is sure to come and it will be a change for the better.

The automobile is quicker, and is practically as sure. The risk of the driving machinery breaking down in transit is no more and possibly less than that of accidents to fire apparatus drawn by horses. The use of motor driven engines, hose wagons and ladder trucks will soon breed expert chauffeurs and automobile mechanics in the fire department. The apparatus will be kept in thorough repair and adjustment and the occasions when it fails to meet the demands made upon it will be rare indeed. The speed with which it can be hurried to fires will be limited only by its ability to withstand the shocks of the road. In the long run the cost should not be any greater than that of maintaining the horses. The fire department would do its own repairing and the life of each machine should be a long one.

But even if the expense of the fire department should be increased it would be more than made up for by the decreased fire losses due to greater quickness of action. —*Cleveland Leader.*

A large garage is to be erected at Glendale, Cal., by the recently organized Riverside Auto Transfer Co., of Los Angeles, Cal. The new concern's object is to conduct a motor transportation service between Los Angeles, Riverside and Glendale.

TO MAKE AND OPERATE WAGONS

FOR some time past C. W. Kelsey, who for several years has acted as sales manager of the Maxwell-Briscoe Motor Company, has been contemplating active participation on his own account in the motor wagon industry. To gain freedom for this work he has resigned from the Maxwell-Briscoe Company.

In the course of a recent European trip Mr. Kelsey saw much of the development in the manufacture and employment of industrial motor vehicles, and upon his return to this country concluded to manufacture and operate wagons and trucks for city transportation service. He expects to announce at a very early date the formation of a large company which will devote itself to this work. The company will be strongly financed. It has already secured control of a large and well equipped manufacturing plant. The details of manufacture and the operation of services have not only been worked out, but are being gradually put into execution.

Mr. Kelsey's company will not place any wagons on the market. The vehicles manufactured will be leased to merchants, with drivers, while the care and repair of the vehicle will be undertaken by the company. A model training school for drivers will be a feature of the new enterprise.

It is probable that the company will at an early date undertake the manufacture and operation of motor cabs fitted with taximeters. Mr. Kelsey is to be the executive and organizing head of the new company.

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Gasoline Wagon Operation

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

WASTE of gasoline in operating a wagon is invariably assumed to be a sign of carelessness on the part of the driver. While in many cases the charge may lie, it cannot be admitted that it is always true. Leaks in the fuel system are very common. An observing driver was recently using a mixture of paraffin and gasoline in his tank, and found that in two of the unions and in one other place moisture collected, and attracted dust, which remained at these spots as long as the paraffin was used. This showed that leaks were taking place at these points; so the tank and unions were taken down and tested under pressure. Leaks were found to exist, and were repaired, and no further trouble in this direction was experienced for some time. After a year's running a paraffin mixture was again used, when leaks in these same places again showed themselves. This showed that during part of the twelve months when gasoline alone had been used the gasoline had been leaking, and some of it had consequently been wasted. If, therefore, high consumption is experienced, and the ordinary remedies fail, we would suggest using a mixture of gasoline and paraffin, say in proportions of one gallon of paraffin to four gallons of gasoline, when the paraffin will percolate through any leaks, but will not evaporate, thus rendering the locality of the leak easily determined. As soon as the leaks are found out and repaired gasoline alone can be used again if desired. An alternative is to place in the fuel tank a few grains of some analine dye. This will color the gasoline, say, a dark blue without affecting its qualities. The dyed gasoline will now pass through these leaks and leave a stain wherever a leak occurs.

* * *

Loose Spring Clip Nuts

It is essential that the nuts holding the spring clips to the wagon axles be kept tight at all times, as once they are allowed to slack off the axles are apt to shift, throwing the springs out of position and thereby bringing an unequal load on the two ends. This sometimes allows the axles to shift transversely of the car and, in the case of the rear set, alters the stresses in torsion or radius rods, with frequently disastrous results. In new machines the nuts are always apt to become loose after a short period of service, owing to the weight of the body tending to compress the bed blocks under the springs, and also because the leaves are apt to settle down somewhat in use. Hence it is necessary that all the nuts be gone over occasionally as a precaution.

* * *

Care of Propeller Shafts

The universal and plunging joints of the propeller-shaft are subject to a considerable amount of friction, and their perfect lubrication is absolutely necessary. In some wagons the universal joints are enclosed in oil or grease retaining metal casings, but if such fittings are not provided the joints can be very efficiently protected against the ravages of mud, water, and grit as follows: Get a saddler to sew you up a tube of thin but strong patent leather equal in diameter to the largest lateral dimension of the universal joint and of sufficient length to extend two or three inches on each side of the sockets of the joint. Dismount the propeller-shaft and draw the leather tube over it. Remount the shaft, lubricating the wearing parts before so doing. Fill up each end of the leather tube with good grease, not too stiff. Attach and bind the ends of the leather tube round the ends of the universal joint with pliable brass wire, so as to make a grease-tight joint. The universal joint will then be running in a grease filled gear case, within which the flexion of the parts will insure the continuous penetration of grease to all the bearing surfaces.

* * *

Testing Ignition Batteries

The only reliable way to test a storage battery is by a low reading voltmeter (0-3 volts). If one wants to know how far the battery is run down the voltmeter readings should only be taken when the motor is running. Other tests are of no value whatever. A storage battery, even if run down altogether previously, will nearly always register 2 volts per cell on open circuit, as it is well known that accumulators always recuperate on open circuit. If they are put to work, however, the voltage immediately drops. Therefore "open" readings are of no value. The driver should always test before taking a trip; it will save him much annoyance. Each cell should be tested individually. A fresh charged cell usually registers 2.25 volts on open circuit; when working on a coil from 2.10 to 2.15 volts. As soon as the voltage falls to 1.80 the battery should be recharged at once, as the voltage falls rapidly from this point. A storage battery—no matter what make—will stop working a coil very abruptly and without any warning at all. This generally puzzles the driver a good deal and, of course, he blames it all on the battery, as he cannot account for the sudden stop. If he had taken a voltmeter reading before leaving, he would have found that the cells registered about 1.85 volts each, and he would have known that it was impossible to run 20 miles before the battery would give out.

* * *

Some Ignition Battery "Dont's"

Don't go out without testing the battery; don't run it below 1.8 volts; don't wait long to have it recharged; don't test it with an ammeter; don't lay a screwdriver or file across the connections to make it spark; don't recharge with alternating current; don't use the wrench to tighten binding posts; don't bring a lighted cigar near a battery during the charge.

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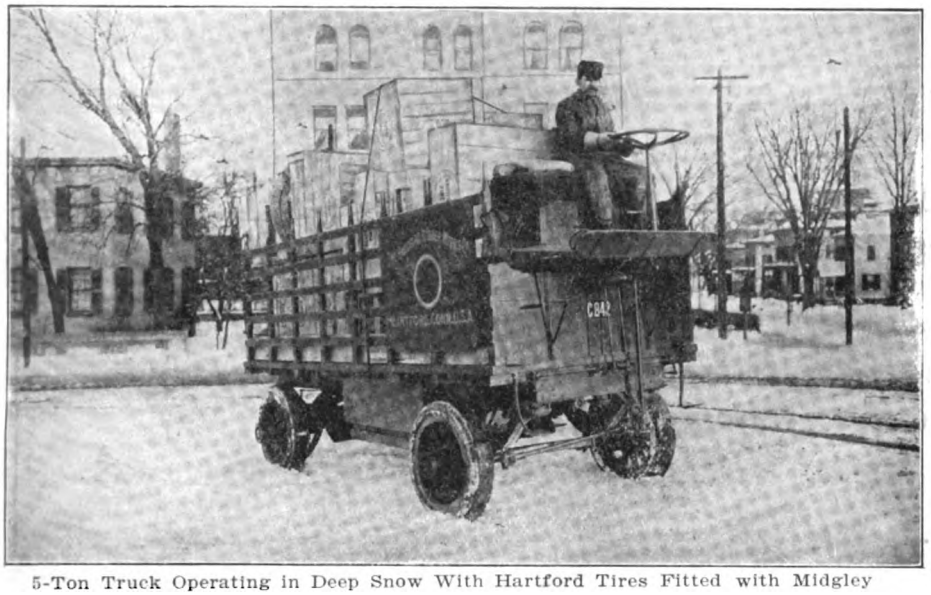
Information For Buyers

THE HARTFORD NON-SKIDDING TIRE—The Midgley non-skid wire tread, supplied with solid tires made by the Hartford Rubber Works Co., of Hartford, Conn., has been giving a good account of itself during the recent months of wintry weather and slippery streets. The illustration in this page shows a five-ton truck used at the factory in transferring freight to and from the railway station. During the past two or three seasons the company has not been able to use this truck when there was any snow on the ground, but with the non-skidding device has for the last few months been operating it without any trouble in from 5 inches to 12 inches of snow. The picture was taken on Capitol Hill in Hartford in about 10 inches of snow, and shows the motor truck loaded with 10,080 pounds of freight. The truck traveled up this ten per cent grade without any loss of traction. The Midgley tread consists of a regular series of connected rings embedded in and made even with the surface of the tread. It saves the wear on the rubber in somewhat the same manner that the nails or pegs in a boot or shoe save the leather, as well as adding to the firmness of the footing.



5-Ton Truck Operating in Deep Snow With Hartford Tires Fitted with Midgley Non-Skid Tread.

♣

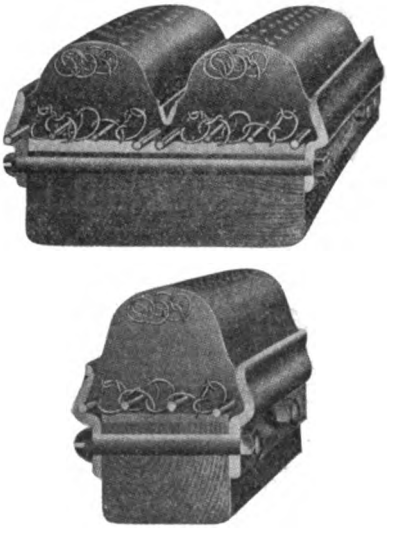
KNOX OUTLOOK BRILLIANT.—At the annual meeting of the stockholders of the Knox Automobile Co., Springfield, Mass., the following directors were elected: E. H. Cutler, W. E. Wright, A. E. Smith, P. Murray, A. W. Cutler, W. H. Chase, M. J. Greenwood and G. W. Bennett. The directors re-elected the old officers: E. H. Cutler, president, and W. E. Wright, vice-president. Owing to a custom peculiar to Massachussetts, the stockholders elect the treasurer and secretary, who were, as in the past year, respectively, A. E. Smith and H. G. Farr. The directors then elected their executive committee, which consists of E. H. Cutler, president; W. E. Wright, vice-president; A. E. Smith, treasurer; H. G. Farr, secretary, and G. W. Bennett, sales manager. The treasurer's report showed a surplus equal to 13 per cent. of the capital stock, while the sales department reported that the output had been disposed of for eight months ahead. The meeting was the first one held in the enlarged plant and gave some of the stockholders their first view of the additional four-story building, 200 x 75 feet, which had been erected and of the foundry and body and trimming shops that have been added to the plant.

♣

A SEVERE TEST.—W. M. Lawton, a gasoline dealer in Rockford, Ill., recently bought a gasoline truck from the Meiselbach Motor Wagon Co., of Milwaukee, and drove it from that city to Rockford, where it will be used in supplying fuel to the owner's city and country trade. It is not likely that Mr. Lawton will soon forget his experience in bringing the wagon home. The weather and road conditions during the journey, while not calculated to make a man well contented with life, proved useful in testing a motor wagon. At the outset of the trip the thermometer reistered 6 degrees below zero. Before reaching Rockford it was raining, and the roads became so bad that at times the wagon wheels were sunk ten inches in clay. The truck, however, performed the entire journey without the slightest mishap, the engine working perfectly and the friction transmission with which Meiselbach vehicles are fitted, proving equal to every demand made upon it.

♣

HARTFORD TIRES ABROAD.—The following testimonial, given to the Hartford Rubber Works Co., of Hartford, Conn., by a firm of British motor bus makers, is a splendid tribute to the durability of their solid rubber tires: "We think you will be gratified



Hartford Tires With Midgley Non-Skid Tread.

to learn that one of the 34 x 3½-inch tires originally supplied to us by you has now done about 27,000 miles upon a 16-passenger omnibus, and is still running.—Clarkson Limited."

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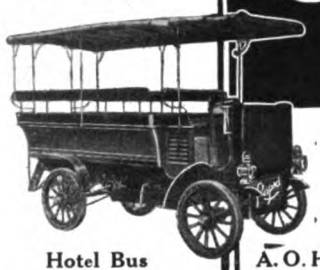

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Our hotel bus and sight-seeing cars are handsome, stylish, and simple in operation. They will make money for any hotel, club, or private investor.

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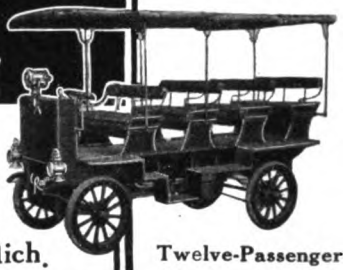
A. O. HENRY, Sales Mgr. RAPID MOTOR VEHICLE CO., Pontiac, Mich.



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But do you know the extent of the economy to be gained by the substitution of motor trucks and wagons for horse drawn vehicles?

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

NO. 29 APRIL, 1907 NO. 29

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WALTER WARDROP, EDITOR

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A Notable Conversion

Fiss, Doerr & Carroll, the Largest Firm of Horse Dealers in the World, to Sell Motor Wagons

WITHIN the past month an event has transpired which strongly fortifies the faith of those who believe that the vast bulk of city merchandise will soon be carried in power wagons. The largest and most influential firm of draft animal dealers in the world—Fiss, Doerr & Carroll, of New York City—realizing that further opposition to the commercial motor vehicle is both futile and hazardous, has decided to espouse its cause and sell motor trucks in the market it so thoroughly dominates through its horse sales.

* * *

No more notable conversion than this has occurred in the brief but brilliant history of the motor wagon, though it has been preceded by many which out-rival it in industrial importance. It is all the more noteworthy from the fact that Fiss, Doerr & Carroll have long commanded the field forces which are marshalled against the power wagon. Being men of wide acquaintance and possessed of unusual administrative capacity, they found little difficulty in placing obstacles in the path of a movement which, if permitted to gain headway before it could be brought under their control, would be certain to seriously impair their existing investment. Perhaps in the beginning of its hostility the firm was really convinced that its course of action was justified, for machines which were well designed, well applied or properly administered, were rare. But as time went on and engineering practice began to conform to commercial needs, motor truck users became more enlightened and the economy of the vehicles was definitely and widely established. Knowledge of this economy could hardly have been withheld from Fiss, Doerr & Carroll, as they still continued to sustain intimate trading relations with all the concerns which had replaced some of their big firm of horse dealers must have been feigning an aversion they were very far from feeling, masking their batteries as it were. Events prove the correctness of this surmise, and experience further warrants the wisdom of such strategy.

How long Fiss, Doerr & Carroll have been contemplating this revolutionary change of policy we do not know, but that it was nicely timed is very apparent in view of the growing demand for industrial motor vehicles. The advantages of the motor wagon are now pretty generally apprehended where they are not already definitely known. Everybody, even those most profoundly ignorant of the gross or fine character of its economy, speaks in glowing terms of its usefulness. Small merchants, who know nothing of its mechanism, covet its superior speed and range and justifiably believe that a little experience will enable them to profit by its employment. Large ones, to whom its employment is either suggested by familiarity with touring cars or the example of competitors, find its temptations irresistible. It is found in every kind of service imaginable, paying handsomely wherever it is not misapplied and badly cared for. These things are apparent to all, but chiefly to those whose investments they affect.

* * *

Some folks whistle to keep up their courage and deceive observers. For some years past the large breeders and sellers of draft animals have been informing whoever would listen that, despite the extraordinary demand for automobiles of all kinds, the demand for horses was steadily increasing. Reams of paper have been soiled in order to prove that this was a clear indication that the draft animal was more than holding his own. Quite as much anxiety,

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however, was displayed in concealing the fact that useful draft animals are not being bred as fast as the needs of commerce demand; that, in fact, the menace of the commercial automobile has arrested the energy of horse breeders and dealers and quickened the intelligence of a business people who are instinctively aware that no form of animal labor can compete with machinery in a service where the latter is peculiarly well qualified to render assistance. No arguments have ever been presented to combat the contention that the horse in merchandise transportation is inferior to the motor vehicle. Much has been said in villification of the machine by people who have never tested its economy. Its high first cost is a favorite topic of discussion among concerns who have strong commercial reasons for belittling its performance, but strangely enough such firms have not a word to say about the reduction in drivers' wages which the employment of the machine affords, or the greater speed, tonnage and mileage it can show to its credit at the end of a year. Nor are we often enlightened concerning the riskiness of draft animal investments which, to quote the language of one of the foremost champions of the horse, are the "riskiest of risks."

* * *

The defection of Fiss, Doerr & Carroll—for such the unenlightened horse interests will term it—means more than the mere loss of a leader. Scant reference has already been made to the magnitude of the firm. Its annual sales are seldom less than 50,000 head of horses, and this year are likely to reach 75,000. Nearly all the large commercial houses in New York City buy their draft animals from Fiss, Doerr & Carroll, a patronage which is heavily increased by sales made to the government and by exporting to foreign markets. The company owns and operates the largest horse sales stables in the world in New York City on Twenty-fourth street, between Fourth avenue and Lexington avenue. In its seven-story concrete building three floors and the basement are used as stables. The four top floors contain pleasure and commercial vehicles of all kinds likely to be used in the commerce of a large city. The enterprise of the firm is not confined to the sale of horses or horse vehicles. Each of the partners is a man of large operations and commercial experience, Mr. Carroll being one of the contractors engaged in excavating the foundation of the Pennsylvania railroad station at the New York end of the Hudson River tunnel. Naturally they have perceived the wide variety of uses to which the motor wagon is put in New York City and have noted the causes which contribute to the machine's economy. Being progressive and alert they have determined to be in the business of selling power wagons, as in every other undertaking which demands their attention, considerably in advance of their competitors.

Whatever enterprise engages the attention of Fiss, Doerr & Carroll, thoroughness in the execution of it is always a marked characteristic. In selling motor wagons they do not propose to reject experience and grope blindly to a success. Having accepted the general agency in the territory of New York for the two-ton gasoline trucks made by the Reliance Motor Car Company, of Detroit, Mich., they immediately took the precaution of acquiring the services of that company's former New York manager, whose commercial experience and mechanical knowledge will be heavily drawn upon. The worth of this trade connection has already been established, Fiss, Doerr & Carroll having sold motor trucks to three of the biggest establishments in the city since they were commissioned as agents.

It is understood, but not officially confirmed, that Fiss, Doerr & Carroll will also act as agents for the American Motor Truck Company, of Lockport, N. Y., making five-ton gasoline trucks.

MUNICIPAL MOTOR ASH WAGON

FROM all appearances Cincinnati will be the first American city to employ the motor wagon in street cleaning. Three machines are to be purchased by the Board of Public Service at a cost of $3,800 apiece.

HUNDREDS OF ELECTRIC CABS BURNED

SINCE the destruction by fire of about 200 of its electric cabs, on January 28, the New York Transportation Company has been operating its service as well as its badly crippled condition would permit.

The fire, which broke out in the main station, completely swept the central portion of the building at the northwest corner of 49th street and Eighth avenue, 350 by 100 feet, destroying about 200 vehicles and the company's shops and battery handling plant. The new five-story fireproof section of the building at the west end of the property, which was nearing completion, was only slightly damaged and repairs upon it are now proceeding. It will be ready for occupancy this month. The annex at 344-348 West Fiftieth street was also saved, and by the use of these premises and the stations at 230 East 66th street and at 27th street and Ninth avenue, a large number of the company's vehicles have been kept in operation without interruption.

Plans are now being prepared for a fireproof structure to replace the burned portion of the building, and it is expected that this will be ready for occupancy before next winter. The loss is fairly well covered by insurance, but the consequential loss of business has been very great.

The little town of Astoria, Ill., is right up to the minute. The local organ of public opinion makes this announcement: "Our enterprising baker, W. H. Carter, is constructing an automobile delivery wagon for his own use and we are anxiously awaiting the hoot! hoot! of his horn as he delivers fresh bread in time for dinner."

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A Large Enterprise

San Francisco Company With $1,000,000 Capital to Operate 46 Commercial Motor Vehicles

THE day of large motor wagon undertakings is here. The dark and dreary period of commercial experimentation, which in reality came to an end three or four years ago, when it was demonstrated that vehicles well applied and well cared for were indubitably economical, has been succeeded by an era in which even the most conservative establishments exhibit an eagerness to embrace the new method of transportation.

The daring pioneers who had the sagacity to anticipate the time when commercial motor vehicles would be generally employed must take keen satisfaction in noting that a company has been organized in San Francisco with $1,000,000 capital to engage in general motor freighting between that city, Oakland, Alameda, Berkeley, Fruitvale and Hayward, at all of which points extensive garages and warehouses will be established for the purpose of making this the most important enterprise of its kind in the country. It must be plain that the hazard of motor trucking has wholly disappeared when an undertaking requiring the employment of forty odd vehicles is launched and supported by so much capital for the purpose, as announced, of rivaling the local service of the Southern Pacific Railroad.

The organization in question is known as the Interurban Motor Express Company. Its principal stockholder is C. T. Walker, an Oakland banker. His associates are Victor Etienne, W. Runyon, William High, W. Well and other equally well-known local capitalists. The manager of the company is F. B. Signor. On the first of last month twenty light Knox wagons of 3,000-pound rated capacity, were placed in express service between the points already named. Within a very short time twenty-six three-ton Knox trucks will be operating in the heavier service of the company. A thirty-minute freight service across the bay has been planned in order to relieve the traffic congestion now prevailing. The traffic manager is F. W. Childs, formerly with the People's Express Company, an organization which placed dependence in horses and wagons.

Probably at this moment no city in the country offers such splendid opportunities for the motor wagon as San Francisco. The earthquake not only caused great loss to those whose capital was invested in horses and wagons, but occasioned an unprecedented demand for vehicles of every kind which could be employed in removing debris, hauling building materials and the countless other forms of merchandise for which there was instant demand the moment the restoration of the stricken city began. As soon as the insurance companies had settled the claims of those whose property was destroyed there ensued among the beneficiaries an astonishing eagerness to re-invest in the same enterprises which had formerly engaged their attention. This was the chance for the motor wagon. Teamsters, expressmen, cartage companies, all who formerly employed horses and wagons, began to consider the purchase of motor vehicles. The result was a veritable boom for motor road transport, the full fruitage of which was the formation of the company under consideration.

CAB AND EXPRESS COMPANY

MUCH secrecy surrounds the efforts of C. W. Kelsey to organize a motor cab and trucking business in some of the principal cities of the country, of which enterprise an imperfect outline was presented in the last issue of this paper. The only scraps of information which are obtainable are these:

The organization will be known as the American Cab & Express Company. Garages will be established in New York, Chicago, Philadelphia and Boston. The cabs will be fitted with taximeters. All vehicles will be made and operated by the company. All drivers will be trained at the company's factory and paid a percentage of vehicle earnings, as is the custom abroad. Trucks will be leased to merchants by the year and kept in repair by the owning company.

It is unofficially stated that Kelsey and his business associates have secured an option on the plant of the bankrupt Eisenhuth Horseless Vehicle Company at Middletown, Conn.

Nobody knows what the cab or truck models will be like, how much real money lies back of the enterprise, who outside of Kelsey is connected with it, or whether any member of the organization is qualified by previous experience to steer it to success. Thus far all the public is permitted to know issues from the office of a press agent who evidently has orders to talk and write wide of the mark.

In France the motor bus has the legal right of way over other forms of motor passenger carrying road vehicles.

Two cents is the fare now being charged to passengers by several motor bus companies in certain districts of London.

The Wabash railway company has announced its intention of establishing a motor car service between Kansas City and Excelsior Springs, to become operative in the spring, 33 miles being the distance between the two places.

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Chicago's Motor Express

Package Delivery for Retail Merchants Conducted by Motor Dispatch Company

ELABORATE plans for the delivery of merchandise in the western metropolis by means of light motor wagons have been perfected and partially put in operation by the Chicago Motor Dispatch Company, an organization, capitalized at $25,000 and employing ten Logan machines, which has contracted to deliver goods for twelve firms located within the loop district. Within six months it is expected the growth of the business will justify the purchase of ten more wagons.

The president and general manager of the company is John B. Maus. Associated in the enterprise with him are William J. Brown, Jr., vice-president; Graham Duffield, secretary and treasurer; Ralph A Bond and Vincent J. Walsh. Headquarters of the company are located at 347 Wabash avenue. The crew of each wagon consists of a driver and jumper boy to deliver packages. The rated capacity of the vehicles, which are fitted with 10-hp. engines, is 1,500 pounds. Their carrying dimensions are as follows: Five feet 6 inches long, 4 feet 8 inches high and 3 feet 6 inches wide. The machines have a wheelbase of 86 inches, 30-inch wheels with 3-inch Swinehart tires and are geared for 15 miles per hour.

At 8:00 A. M. the wagons set out on their collection tours, returning by 10:00 A. M. to the garage, where four package sorters distribute the merchandise in half an hour and see that it is placed in the wagons which transport it to various parts of the city. For two and one-half hours the wagons are busy with deliveries, all reporting to the garage at 1:00 P. M. at which hour the drivers and their helpers have lunch. At 2:00 P. M. the wagons again make collections from the houses in the loop district which they serve, returning at 3:00 P. M. to the garage, where another half-hour is required to sort and distribute their loads and start them delivering again. At 6:00 P. M. all wagons are back at the garage and the days work is ended.

This service is almost identical with that which was started in Detroit three years ago by the Detroit Auto Vehicle Company, an organization which, till fire damaged its premises and rolling stock, employed 20 gasoline wagons and made deliveries for about 80 retail houses. The fire, by the way, resulted from the explosion of gasoline, bad garage ventilation and careless handling of the fuel being charged as causes for the catastrophe.

On Saturdays the Chicago Motor Dispatch Company makes a late collection, receiving parcels for delivery as late as 5:30 P. M. Books containing $50 worth of ten-cent coupons are sold to the concerns for which the Motor Dispatch Company performs work. At the time of collecting parcels one or more of these coupons is pasted on the package and checked and cancelled by the driver. A charge of 10 cents is made for parcels under 10 pounds delivered within a short radius, and 20 cents for parcels over this weight and delivered a greater distance.

Packages are delivered for shoe merchants, haberdashers, milliners, florists, druggists and dry goods merchants. The loads are light, seldom exceeding 800 or 900 pounds.

SOME SPLENDID TIRE PERFORMANCES

EVERYONE who operates motor wagons, or who has ever thought of operating them, has heard the hard-luck stories which certain establishments, invariably without name, are alleged to have told concerning their experience with solid rubber tires. Rumor, particularly when it is damaging to commercial interest, runs fast.

People who have heard these mournful tales rarely pause to think that in the majority of cases tires give good satisfaction, particularly when it is reflected that the treatment they receive at the hands of inexperienced drivers is not such as to make for longevity. In almost every city of any importance there can be found records of sets of tires which have shown the most remarkable durability. In Cleveland, for example, there is a brewing company operating 3-ton electric trucks which has not changed tires on one of these machines for a period of almost two years notwithstanding the vehicles have been in active operation throughout the greater part of that time. The daily service of these tires has been about twenty-five miles. They are still in good condition.

In foreign motor bus service, where the vehicles loaded weigh about seven tons, it is common to find tires which have traveled 18,000 miles, and in one instance a front wheel tire of one of these machines has been shown to have traveled 22,000 miles, with plenty of life yet left in it. Another bus tire has given 27,000 miles. These are wonderful records. They would be more common if owners of motor trucks were willing to testify to the service which solid tires have given.

A motor bus line is operating between Fort Collins, Ault, Eaton and other points adjacent to Greeley, Colo.

The Geneva and Lake Erie Automobile Line, with a capital of $10,000, proposes to operate a line of motor stages from Geneva, Ohio, to the shore of Lake Erie and other resorts.

With a capital stock of $10,000 the Metropolitan Omnibus Company has been organized in Detroit to operate motor omnibuses in the streets of that city.

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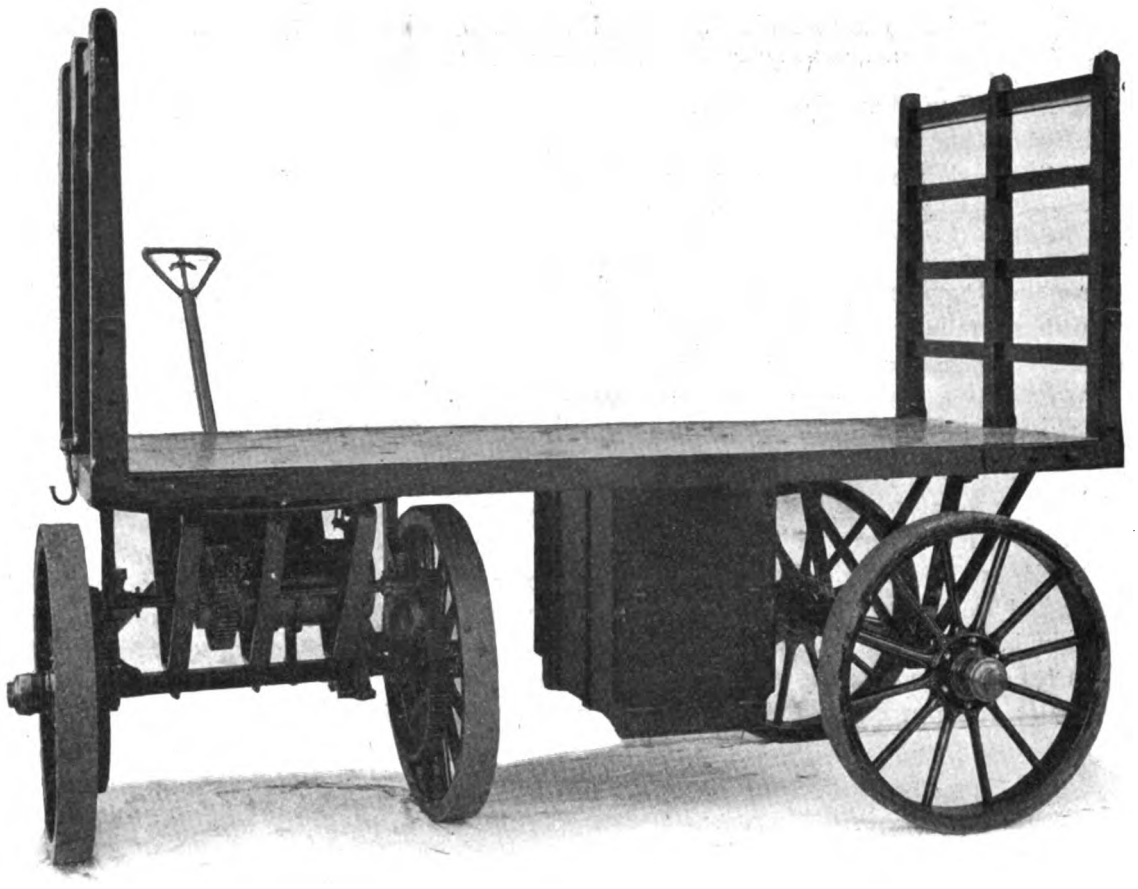

Pennsylvania Baggage Truck Built by McCrea Motor Truck Co.

Depot Motor Baggage Trucks

Description of Electric Truck Used in Philadelphia Station of the Pennsylvania Railroad

LAST summer it was first announced in this paper that the Pensylvania Railway Company was experimenting with electrically operated depot baggage trucks, with a view to eventually replacing the ordinary hand drawn baggage trucks in all of the principal stations of its very extensive system. The period of experimentation, conducted at the company's shops in Altoona, now seems to have been satisfactorily terminated, for four of the trucks are now in active use, three of which were modeled by the Pennsylvania's designers and one by the McCrea Motor Truck Co., of Cleveland.

All four of these trucks are in service at the Broad Street Station of the Pennsylvania Railroad in Philadelphia. Their convenience, the ease with which their operations are controlled, their low cost of maintenance, their superior load carrying capacity, the rapidity with which they convey mail and baggage to and from trains, and the saving in truck handlers' wages which their employment affords, all support the company's belief that ultimately the hand-pulled depot trucks will be abandoned, except in the smaller stations.

Before deciding that this was the type of depot motor baggage truck which would prove most serviceable and economical, several extended experiments were conducted with electric motor wagons of the kind customarily seen on the streets, but fitted with regular depot truck platforms. It was early apparent that the latter form of construction was too costly, unhandy, unnecessarily elaborate, and required more expensive labor for its operation than the work to be performed would justify. No further experiments, therefore, were made in this direction. As the company would not consider any other motive power but electricity, the development of the present type of motor truck was inevitable. After several months of study the McCrea Motor Truck Co. produced its model, which possesses the advantage of extreme simplicity in design. Its action is so much like that of the old-style hand-drawn truck that if one did not examine it closely he might fall into the error of supposing it was an old model. Its instantaneous control when running along a crowded platform, and its battery housing, are about the only things which attract the attention of close observers. The ordinary person sees in its general construction nothing to excite his curiosity.

The modus operandi is as follows: The operator walks in front or at the rear, as occasion demands, gripping the handle of the steering arm. The control is located in this handle. It consists of a switch which when in contact releases the brake and starts the truck forward or backward, at the will of the operator, but which when out of contact, or when the steering handle is dropped, causes the brake to be automatically applied and brings

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the truck to a stop instantly. The pressure or removal of the operator's hand upon the handle is all that is necessary to accomplish starting or stopping.

Each truck, which may be turned within its own length, is fitted with a single motor and a twelve-cell battery. The battery is charged and cared for by the station electrician.

Speed in handling baggage and mails is a very important matter with all railway companies. Passengers naturally want their baggage to accompany them on their journeys. It often happens, however, that a passenger doesn't deliver his trunk to the baggage room until five minutes or less before train time, and yet he expects to have it in the baggage car before the train leaves. What this means in a station, like that in Philadelphia where motor baggage trucks are operating, where six hundred trains a day enter and leave, each carrying its share of baggage which must be promptly cared for, may readily be realized. It is not uncommon to see several baggage porters pushing and tugging at one heavily loaded hand truck in their effort to deliver its burden within the allotted time.

The class of labor employed to operate hand-drawn baggage trucks is more highly paid and more difficult to recruit than most people would suspect. The work is arduous, the hours of service are long, and the physical effort put forth at times so vigorous as to make the men discontented with their employment. In many railroad stations the greatest difficulty is experienced in obtaining and retaining labor of this kind. Miners, the roughest class of foreign labor, and giants from the timber country are constantly being impressed into this service, but at the end of two or three weeks they have had enough of it and quit. The motor baggage truck will naturally reconcile these workmen to their duties, since it will relieve the greatest of their physical hardships.

Express companies have fully as much need for the motor baggage truck as railroad companies. The former having to load and unload their own cars as they stand on the rails, are much impressed with its value as a labor saving instrument and will in all probability soon be making extensive use of it.

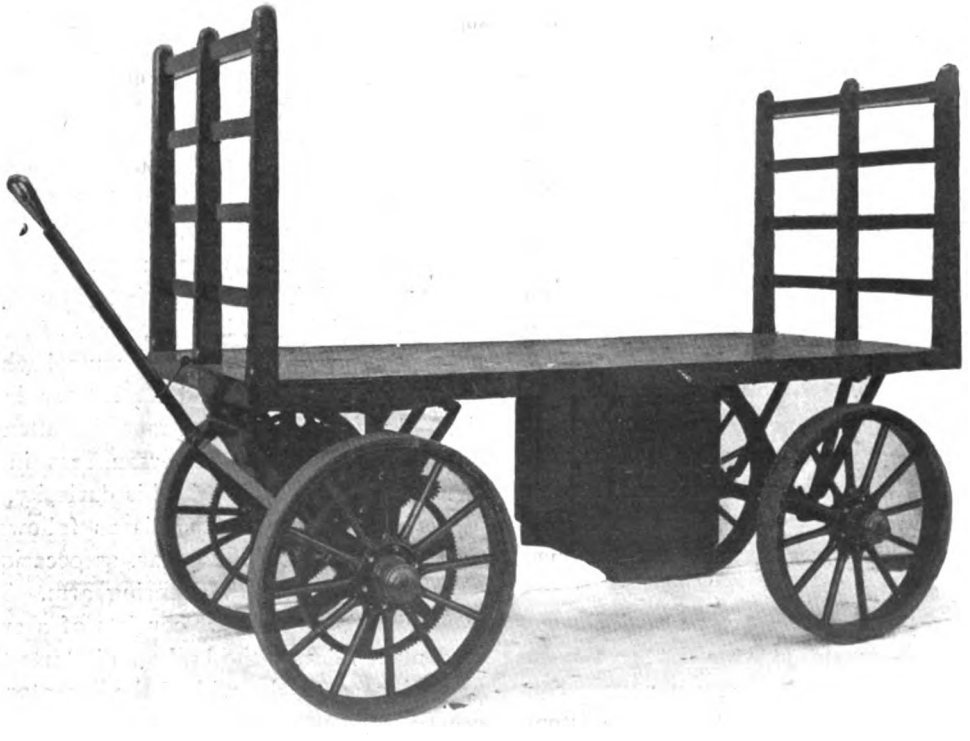
It is proposed to run a motor bus line between Nashua and Wilton, N. H., and to extend the line now running from Fitchburg as far as Greenville, thus making a loop from Fitchburg to Nashua.

The Idaho Automobile & Electric Transportation Co. has been organized with a capital stock of $25,000.

Motor bus service is to be supplied Superior, Wis., this spring.

An attempt is being made to form a company for the operation of a motor bus line between Port Huron and Croswell, Mich., by way of Lakeport and Lexington. Machines to carry 40 passengers will be needed if the project does not collapse.

Seven one-ton motor wagons are steadily used by a large fruit growing firm in San Jose, Cal., in transporting its merchandise from the farm to the warehouse and depots.



Another View of the Pennsylvania Baggage Truck Built by the McCrea Motor Truck Co.

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Military Automobiles

Signal Corps Chief Predicts that Motor Wagons Will Not Supersede Mules in Transport

WHEN one of the chiefs of the signal corps intimates that the automobile will never in our time be extensively employed in any branch of military service but his own, he not only casts discredit upon the opinions held by executives in other army departments, but encourages the illusion that the usefulness of the machine is special rather than general.

It is more than likely that Lieut.-Col Scriven, the chief signal officer of the Department of the East who makes this intemperate prediction, bases it upon the experience he and his subordinates have acquired from the use of converted touring cars. The signal corps has never had occasion to test the merit of motor wagons or to estimate the important service these heavy duty vehicles are capable of rendering in the transport of stores, baggage and munitions. Lacking such foundation the opinion of its chief is comparatively worthless. Moreover, it contrasts oddly with the opinion entertained by the quartermaster general and other army administrators who have experimented with motor wagons and in consequence thereof are prepared to concede their superiority to draft animal transport wherever their employment is judiciously ordered.

The habit of regarding the touring car as an instrument well adapted to general service is not confined to army specialists. It is more pervasive than is desirable. Time alone will eradicate this false impression and make it clear that the vehicle designed for pleasure is not more applicable for industrial work than a brougham is to a dray service.

* * *

It will be interesting to follow Col. Scriven in his study of the army automobile. At the outset he makes it apparent that the only type of vehicle which appeals to his imagination is the light car which can be equipped for special field service or used by staff officers as a substitute for horses. Only once does he allude to the heavy duty vehicle, and then to discredit its usefulness. He swears by the army mule, in which respect he only differs from transport officers who believe there is more to be gained by swearing at the long eared brute. His suggestion that automobiles be fitted with searchlights operated by the power plant of the vehicles is not new. We illustrate such a machine, which was built a couple of years ago for the French army. As a final touch to a discouraging picture, he sketches the difficulty encountered in procuring skilled drivers from the ranks of enlisted men. The quartermaster general does not consider this difficulty as insurmountable, believing that the establishment of a school of automobile engineering at West Point and an automobile section in the army itself would speedily provide an abundance of supervisory knowledge and ordinary skill required to operate military motor vehicles. And he is confirmed in this opinion by the results obtained in England, where even the militia has its corps of men who are competent to discharge the functions of drivers of touring cars, motor wagons and motorcycles.

* * *

The use of the automobile by the army will follow its ascendency in commerce. Its immediate employment, however, is merely a matter of military expediency, and that, by the way, is always potent in bringing about army reforms. With these introductory remarks we present Col. Scriven's opinions to our readers:

I do not think much of the armored car as a general assistant in field warfare. It may have its occasional uses, as has the armored train, but they are limited and it has in addition many negative features. It is heavy and has to stick to roads. If it breaks down it is helpless, particularly if it were to break down in the face of a rapidly advancing enemy. No, in this country, we want automobiles for more pratcical purposes.

Where the automobile will cut the most important figure in war time will be in its use as an assistant to the signalling department, in the laying and operating of field telegraph and telephone wires. You know, an advancing army is always kept in touch with its base and communications by wires which are steadily laid as it advances. It is the duty of the signal corps to see that the skirmish line is always in touch with the commander-in-chief in the rear, and conversely, to see that the wires are always in good condition.

This is a difficult task, for the first line of wire, the "flying" line, we call it, consists of extremely light wire, weighing seven or eight pounds to the mile, and is only strung along the ground. It has to be patrolled constantly to see that it is in good condition. A man on horseback can carry several reels of it and can go anywhere to lay it, so I think that the automobile will hardly supplant that branch of the system, but it will be serviceable for use in patrolling the line. It will enable the men detailed for the work to accomplish it much quicker and consequently make interruptions less frequent.

Then the automobile will be convenient to carry tools in. As I said, we alter it to suit our own ideas. Any good, heavy touring car model will do for the purpose. The tonneau is re-

Signal Corps Vehicle Used in French Army, Fitted With Searchlight Fed by Dynamo in the Wagon.

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moved and a square box built in its place, in which there is room for a few tools and projections over the side to serve as desks for two men who can ride behind there. On the desks can be placed the instruments, the field telegraph or "buzzers," as they are called. These buzzers are very small and convenient and can be employed either for a telephone or a telegraph. Or, in place of this design, we build a little house for tools and instruments.

Another use to which the automobile has not been put, but for which it would, I believe, be valuable, is that of carrying a powerful searchlight. When a force is attacking an intrenched position it is often convenient to know what the other side is doing after dark, and nothing helps out in this respect as much as searchlights. We have, it is true, field searchlights of a sort, but they are heavy and bulky. It seems to me it would be a good idea if a motor car could be invented in which the motor could be disconnected from the gears, if necessary, and switched onto an extra-large searchlight, carried in front or behind the driver's seat, so that all its power would be directed into the lamp. Maybe it would be necessary to have two separate engines on the car, but, at any rate, it would be worth while to have a portable searchlight, strong enough to show up a large area.

I have read numerous articles on the part that automobiles will play in future wars. Most of them are overdrawn. For instance, it is said that they might be used to transport troops across frontiers at short notice, in place of railway trains. That is barely possible, but highly improbable. It is only possible because in Europe the roads are much better than they are here, and it is conceivable that a body of troops might be transported for a short distance in countries whose frontiers are not far apart. But not a large body of men. It would take an enormous number of cars to move one army corps, and think of the amount of fuel that would be used. It would be necessary, days in advance, to establish stations along the route which it was intended to take. Likewise there would surely be some accidents, and the roads would doubtless be blocked with wrecks. It is enough trouble to transport troops by train. In other words, such a movement could not remain secret, and thus would lose its chief advantage.

In this country the very idea is preposterous. We have poor roads and great distances to travel, which, to my mind, makes the automobile as a means of conveyance for troops hopeless. Nor do I believe that it will ever revolutionize the quartermaster's department within our time, for our regulation army mule transportation wagon is the finest in the world, and will suffice. The automobile may become an important auxiliary, but it will never become of paramount importance in this department. I saw the work of our army wagons in China, and they were the envy of all the foreign contingents, so I don't believe the mule is going to be supplanted by the motor just yet.

We want cars of simple construction and powerful make. They do not have to be exceptionally speedy. We would rather have cars that run steadily and normally and are good, consistent hill-climbers. A great difficulty we have to contend with is the securing of good men to drive cars. We have to use enlisted men, and they are not generally intelligent enough to thoroughly understand one of the more complicated designs. The day may come when we will have an automobile section, as we have a balloon section. And that reminds me of another use the motor car can be put to. It can tow the balloons around.

PROLONGED AND THOROUGH DEMONSTRATION

RULES for the government of a prolonged public demonstration of motor wagons are now being preared in England. It is expected the demonstration will begin in September and continue for a month, the vehicles in their journey touching all the principal industrial centers. Representatives of the national association of automobile manufacturers, the national association of motor wagon users, and the national automobile club are now planning the details of this important function, which in its thoroughfares will present a marked contrast to other demonstrations aiming to broadly establish the superiority of motor road transport.

TO IMPROVE BALTIMORE'S STREETS

AN active campaign to improve the streets of Baltimore will commence in the spring. The sum of $1,000,000 is available for the purpose. In addition to this amount the voters will have opportunity at the election next May to vote for the $1,000,000 street paving loan, which was authorized by the last legislature. If the people vote favorably on this loan the $1,000,000 thus authorized will be available for immediate use. Baltimore is badly in need of good streets. Its lack of them has retarded the development of power wagon traffic.

The Milwaukee Automobile Livery Company has been incorporated to do business of the nature implied by the firm's title. Its capital stock is $15,000.

DEATH OF LEON SERPOLLET

IN the death of Leon Serpollet, the well-known French manufacturer of steam motor vehicles, the commercial motor vehicle industry has lost an ally whose services to the cause he so ardently championed will not readily be replaced.

For thirty years Serpollet devoted his talent to the development of steam driven vehicles. First he constructed a steam tricycle and later built a four-wheeled machine. He was the first to demonstrate the speed possibilities of automobiles. He was also the first to apply to them the principle of rapidly generating steam by injecting water in red-hot tubes, thus preparing the way for the now well-known flash generator.

Lately he became associated with Darracq, another celebrated French automobile maker, in the production of motor buses, a company bearing their joint names having been organized to operate these machines in public service all over France.

MOTOR BUSES IN JAPAN

THE Tokio Motor Car Company is a Japanese organization formed to establish motor bus service in the principal cities. Ample capital for the undertaking has already been secured. In Tokio 150 machines are to be employed, and 50 more between that city and the neighboring towns.

The Interurban Motor Express Company has been organized in New York City with capital stock of $45,000.

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The Electric Wagon

Address Delivered by Hayden Eames Before the Association of Electric Vehicle Manufactures

FEW people possess a more intimate knowledge of the genesis and development of the electric vehicle than Hayden Eames, of Cleveland, whose fiery ardor in championing its advantages, even in pioneer days, has always been tempered by sanity. The "apostle of the juice wagon," his admirers affectionately term him out of grateful recognition for service rendered in rescuing the electric vehicle from the obscurity to which early failures and latter day competition had apparently doomed it. Naturally, therefore, he had an attentive audience when recently addressing the members of the Association of Electric Vehicle Manufacturers, an organization, by the way, with more catholic aims than its title might seem to indicate. Upon this occasion he said:

The electric vehicle first appealed to me almost purely by accident. It was in the early stages of the creation of the Electric Vehicle Co. Most people do not know that this company started as the electric carriage department of the Pope Manufacturing Co. There was no intention of making electric vehicles at all. The other day, in looking up some papers, I accidentally came across the first general order that I wrote to the engineers of the company as a result of considerable deliberation. The decision was, that pending the development of a practical gasoline car, we would support ourselves with the sale of electric vehicles, then regarded as toys for the very rich. I had to pinch myself to be sure that what I was reading defined the conditions then existing. Hour after hour I had studied with Mr. Maxim trying to devise some scheme by which the speed of the gas engine could be varied five or six per cent without a change of gear or a total loss of torque. (Laughter.) Now that situation is entirely changed.

All the storage battery experts and the head of the leading storage battery companies of the country at that time did not believe storage batteries were applicable to automobiles. They did not know anything about their application to automobiles. The only people who had ever tried to apply them to automobiles on any scale were Messrs. Morris & Salome, and the very first battery they used showed that the situation was not understood, although they perhaps understood it as well as anybody else. The things we were looking for as accidents in the automobile have never happened. Any quantity of other things have happened; any quantity of them, but those particular things did not happen.

Now it may be perfectly true that the chemical peculiarities and chemical principles of the storage battery have never been improved since, but mechanically it has been improved in a thousand ways and has been adapted to and applied to electric vehicles. The Electric Vehicle Company started from that cause, and became a part of a very large financial scheme and found itself making electric vehicles on a very considerable scale. In the meantime other people went into the business on a very considerable scale and took their part in the development, so that the electric vehicle soon became practical.

I think there is a great tendency among well-trained commercial people to confuse the conditions and requirements of an established industry on a competitive basis with the conditions that prevail at the inception of an industry, when you have got to create the demand before the competition comes in. Now this organization would have done more good two years ago than it will now, but to see it organized now presages a very great improvement for the future. A couple of years ago I found myself and others who entertained the same views considerably ridiculed because we alleged that all engineering problems necessary to successfully transport goods over roads in cities had been solved, in the sense that goods can be transported by power wagons more cheaply than by draft-animals. Most of us know that that is *now* true. I am frequently asked this question: "Why, then, doesn't everybody use them?" Of course we know the unfortunate experiences of the early period of the introduction of electric vehicles, and the slanders that were put on the whole proposition by conditions that really had nothing to do with it, but which were widely spread and widely quoted. These experiences have had their effect, and today we must educate the user, not in the sense of exciting his interest, because he is keenly interested. Everywhere we go we always find them interested, but still there is doubt as to just *what* to do.

That electric vehicles are the best for delivering merchandise in every place, I don't believe for a moment. I believe that vehicle for vehicle the maintenance of an electric power wagon over a long period of years is always better than any other existing power, or any power now in sight.

The maintenance charge, however, is the second in order of importance. The most important expense is that of the driver. The principal consideration in merchandise delivery is to deliver the greatest quantity of goods with a single driver. Such a decided reduction can be made in the number of drivers as will counterbalance the advantage of the electric in favor of some other power not infrequently, but in the great majority of city services it is not practicable to get the full advantage of the additional capability of a prime mover wagon to a sufficient degree to reduce the drivers and compensate for the eventual higher maintenance. Now that, four or five years ago, was rare; today we are seeing it all about us.

I have had prime mover vehicles under my observation for perhaps two years in service to which those vehicles were particularly well adapted. The service ought to have been but wasn't, yet probably will be, a great success. The vehicles were used with the full consciousness of the prime importance of the drivers' account. They drove the vehicles too hard; they made the mileage too great. They made it so great that they crossed the line where the increase in maintenance, due to the severe service, wiped out the saving in drivers due to the long distance. They have waked up to that now and reduced the daily mileage from 65 or 66 to something like 40, and they found that in doing so, they not only materially reduced maintenance, but, somewhat to their surprise, didn't have to add materially to their drivers. I think they had to add one to some seven drivers. These people found with that amount of service they didn't require such expert drivers as with the hard service, and they were able to take on a cheaper class of men, so that by that experience they have saved both in maintenance and drivers.

That story is one of the keynotes of the whole question of the introduction of electric vehicles. It is the ignorance of the public on just such bookkeeping balances as that which is keeping them from adopting the wagons, and making apparent failures of them when they do.

No see how much the application counts. I was talking to a man some time ago in the brewery business. He had been using five and ten-ton trucks of a substantial make for a good many years. He said without hesitation that the three-ton trucks were very satisfactory; five-ton trucks were not satisfactory. In accordance with the current gossip I suggested that possibly the battery capacity on the five-ton truck might not have been adequate. He said, as far as that was concerned, he could throw away the battery once a year and still be immensely to the good. That wasn't the reason. With a five-ton truck the driver got

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through about three-quarters of an hour before the end of the day in delivering his five tons. He was too late to go out again. That is, by hustling a little bit he could save himself a little time at the end of the day and still get the day's pay. The driver of the three-ton truck, even if he dawdled, came in in time to go out and around again. The unit is what you pay the driver and how much one man can do. In the case of a three-ton truck making the delivery of six tons in one day, and in the case of the five-ton truck delivering only five tons with one man, it didn't seem to occur to the owner to make a change of gear by which he could use a four-ton truck and deliver eight tons a day. Those are the points that are overlooked.

Another thing from which the industry has suffered has been the imaginary advantage which some users think they can get by shutting out other users, forgetting that the greatest economies will result from a general dissemination of the knowledge of the care of the vehicles, which can only come from their general use. I have in mind one very large express company which has made a great success of electric vehicles. I don't know how it has been in the last six months, but up to that time it has been almost impossible to get from anybody connected with it an official statement that they are suited with them. I know that the cost of operation of their electric wagons on a large scale in one city is $11 per wagon less monthly than what they counted upon at the time of their introduction. In another city it is in the same proportion. The wagons in the first city are of greater capacity and rating than they need, but they had to get them because they couldn't get any others. Those in the other city are absolutely suited to their needs.

If none of you have ever been in the Buffalo station of the Adams Express Company, you ought to go. It really is wonderful. I suppose I have been in there twenty times in the last two years at all hours of the day and most all hours of the night. I have yet to see a wagon there that was out of commission for a day, not one that looked as though it would have to be out of commission for twenty-four hours if needed. In all that time I have seen just one wagon out of commission, and that was on account of a broken bearing, and they expected it to be in commission in three hours. I might say that since then I did see another, while I was standing around there. They had a wagon come in with a broken gear, and it was out again in less than twenty minutes. With those two exceptions I have never seen any difficulty there. I have never been in there when the total number of wagons which I counted on charge were less than the total number of wagons I knew belonged to the station. Using any kind of a prime mover wagon, you have got to have spares; but nothing but spare trays of battery are required in an electric wagon except such spares as might be necessary for varnishing or painting. Most of those wagons have been in use for nearly four years, as I recollect.

We will take the case of another large express company in this country which had one extraordinary account. The president of the company one day showed me contractor's bids from his Philadelphia outfit for a stable and its equipment for electric power wagons and similar bids for the horse stables. He said: "What do you suppose the difference is?" And of course I couldn't tell because I didn't know what the scale of it was. He said: "Well, the horse stable bid is eighty odd thousand dollars." He told me the figure. "What is the electric stable bid?" I thought a while; I said: "Oh, I guess about $50,000." "No," he said, "it is $21,000, entirely equipped with charging apparatus and the whole business."

Now, take the Adams Express Co., delivering in Buffalo. I asked some acquaintances of mine to step in there the other day and look at it. These people all had experience with electric vehicles. When I said electric power vehicles were likely to be good they gave me the grand laugh, and if I hadn't learned the differences and conditions of the various classifications at that time my own confidence in it would have been shattered, because their experience was tremendous. No, it wouldn't have been shattered, because it couldn't be shattered, but it would have been staggered. I told them to go and look at this Buffalo station. I saw them afterward. I said: "Now I will tell you what you will find. You will find seventeen wagons all on charge. If you find two men there I shall be surprised. You may find two men; you will probably find one." They found one. If they had gone over a certain other express company's stable they would have found a lot of watchmen shoveling horse manure, cleaning up the place, and dawdling from this stall to that—a very different condition. If they had gone to any place where they were operating prime mover wagons in quantity they would have found at least two and possibly three spares. It was the first two months of making minor repairs, which, from an engineering point of view, are no expense whatever, but which have to be made to maintain the percentage of vehicles in operation. They were very much surprised at the result.

Coming into contact with the people managing the New York Transportation Company, I found out another thing which I think we all can afford to take to heart. I labored under the hallucination that because I assumed myself a man of ordinary intelligence who had information himself on the economics of the power wagon, there was hardly anything about electric vehicles that I could'nt talk about. I found I was entirely wrong. I frankly confess that what I know about electric cab business and about the economics of running it, isn't worth a whoop, and I thought I knew all about it. By an equal comparison, the people who are accustomed to that particular field don't know a blamed thing about the things we know. They found out to some extent they didn't when they went to Buffalo. (Laughter.) I found out by spending two or three days with them that I didn't know anything about their end of it. I know more now than I did when I met them, but I thought I knew it before. (Laughter.)

The electric pleasure vehicle can find its best demand in the large prosperous so-called middle class with whom questions of economy are important. A man used to say he couldn't afford an electric. Today when a man says he can't afford to have an electric runabout, all of us on the inside say he doesn't know anything about it. Where there were only one or two carriages in a city two or three years ago you can find a hundred places in any good city today where you can have your electric charged properly.

In fact all of the largest distributors of storage batteries have already got a station in the principal cities where you can go and have your battery examined, cleaned, or have anything you want done.

That puts the electric pleasure vehicle right into the hands of the prosperous middle class. Now it is the large middle class which comes in contact with the economies of operation and the necessities of this economy in the use of electric power wagons for delivering their merchandise in the city. They use their electric pleasure vehicles, and say: "If I can run a vehicle on eight or nine dollars a month what's the matter with the man who tries to run my motor wagons down-town? W'ell see about him!"

It is proposed to form a motor wagon delivery company in Jackson, Mich., the stockholders to be the local merchants whose merchandise will be transported. Half a dozen one-ton wagons will be required for the service it is hoped will be established.

The city of Berlin has made an appropriation of $12,000 for the purpose of making a test of automobile fire engines. One electric and one steam vehicle will be put in service and run daily until each has covered 621 miles. Berlin now spends about $62,000 a year for fire horses, which sum would be available for motors.

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Wasteful and Inefficient

Horse Drawn Fire Vehicles Cost More to Maintain and Are Less Useful Than Motors

THE retention of horse-drawn fire vehicles annually causes a waste of public funds which is very conspicuous to every enlightened economist. Their inferiority to motor vehicles at such times as both have been compared in action has been known for years past to all who take an interest in modern methods for minimizing fire losses. This waste and inefficiency, moreover, is gradually being comprehended by the public at large, and fire department executives who fail to recommend the adoption of motor operated apparatus are being freely criticised for their slowness in taking all due precautions for preserving the property and lives entrusted to their care.

As an example of the waste of money arising from the employment of horses instead of motors take the situation in Chicago, with its 108 engine companies, 31 hook and ladder companies, 17 battalion chiefs, 3 assistant chiefs, supply wagons and other apparatus. For this equipment 600 horses are required, the annual maintenance for each brute being about $208, or a total of $125,000. Does any one imagine, if motors were used instead of these animals, that the maintenance cost would be proportionately as great? Hardly; especially if it was called to mind that the Vienna fire department is pledged to recover its investment of $176,080 in 53 electric vehicles within eleven years, having been induced to wholly discard its horses after three years of highly successful experimentation with motor wagons of all kinds. The saving to the municipality will be $16,000 a year.

The chief of Chicago's fire department has asked for an appropriation of $125,000 to maintain his horses during 1907. Medicine and veterinary attendance is not included in this charge. He also wants $50,000 put at his disposal for the purchase of more horses, and a small matter of $45,000 for harness. Fire department horses are worth about $225 apiece. Thus we find that the year's expenses for the horse equipment will total $220,000, made up as follows:

Appropriation for new horses.....	$50,000
Maintenance of horses	125,000
Harness	45,000
	$220,000.

That is a great deal of money to pay out for the inefficient service of animals which are pawing the air when they are doing their best and eating their heads off when they are idle.

* * *

It is popularly supposed that fire department horses are speedy. They are speedier than other draft animals, but they are much slower than motor fire wagons which safely travel 15 miles an hour on the flat, up hills and down them. A fire engine pulled by horses is just half as speedy as a motor operated engine. Here are the figures to prove that statement, the figures in the tables representing the time consumed in identical journeys by each type of vehicle:

ENGINES STARTING SIMULTANEOUSLY.

Distance from Station.	Horsed Engine.	Motor.
½ mile	3 min. 20 sec.	1 min. 52½ sec.
1 mile	6 " 40 "	3 " 45 "
1½ miles 10	" —	5 " 37½ "
2 miles 13	" 20 "	7 " 30 "

HORSED ENGINE RECEIVING 30 SECONDS START.

Distance from Station.	Horsed Engine.	Motor.
½ mile	3 min. 20 sec.	2 min. 22½ sec.
1 mile	6 " 40 "	4 " 15 "
1½ miles 10	" —	6 " 7½ "
2 miles 13	" 20 "	8 " — "

There is on record an instance where a 300 gallon motor fire engine covered ten miles of a hilly district in a fraction under thirty minutes. A team of horses could not accomplish this feat in double the time. To the motor it was merely an ordinary run which could be repeated as often as necessary.

There is very little actual control over the horses when they are traveling at top speed; in fact fire-engine horses are very much inclined to run away. The only safeguard in such emergencies is a very powerful brake. which, although causing a little mischief to the vehicle when suddenly applied, throws a great strain upon the animals. Where the animals have got out of control this is of little consequence, but where the brakes are applied for sudden emergency in traffic, as they are continually, the horses suffer more or less harm thereby. A motor fire vehicle is always under perfect control, and can be braked in twenty feet and less if necessary, without damaging the machine in any way. No horsed vehicle can be safely pulled up in so short a distance when making its best pace. Besides, it is impossible to drive a horsed fire vehicle at top speed and in a straight line for more than about 25 feet.

* * *

Although in initial cost more expensive than horsed-fire vehicles, motors are infinitely cheaper in operation and maintenance. The horsed vehicle may to superficial observers appear to be much lower in cost in both these items, but a close study of the comparative charges on horsed and motor fire-vehicles will disabuse the mind of this idea. There is a great difference between the first cost of either type of vehicle, but there is also a vast difference between the actual cost of operating and maintaining each type. On the horsed-vehicle side there is the advantage of low capital cost, but the disadvantage of high maintenance charges; on the motor vehicle side there is an apparent disadvantage of high capital cost, but there is a tremendous advantage of low maintenance charges and increased fire-fighting efficiency.

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Current For Electric Vehicles

Lighting Companies Perceive the Value of Cultivating Users of Motor Wagons

GRADUALLY the most progressive electric lighting companies are becoming aware that the sale of current to owners of electric cars, wagons and trucks is a fruitful source of income which they will do well to cultivate. The fact that the use of current for such purposes is largely confined to periods when other demands for it are light makes its sale at a low price possible and exerts a tendency to equalize the load on the lines. Moreover, as nearly all lighting stations possess capacity for generating more power than is required for operating their chief services the disposal of the surplus is made imperative.

As indicating the volume of business awaiting development in this field witness what has been accomplished in the little city of Rockford, Ill. There the Edison Company about a year ago gave two of their clerks a special rate for charging electric automobiles, together with the privilege of selling as many wagons as they could. In a short time they had sold thirty machines and secured as customers for the Edison company 54 owners of electric automobiles. Each one of these owners brings his vehicle to the Edison company once in ten days to be overlooked by their electrician. This is to insure that the batteries are kept in good condition and the motor and bearings oiled. The experiment is entirely satisfactory, the source of income is considerable, and current is drawn at the time of day when the other load is the lightest. Thus the charging of electric vehicles has tended to even the load and has not added materially to the expense of generating.

Naturally the makers of electric vehicles are encouraging the fullest development of this economy. What progress is being made was recently reported by James Macnaughtan, of Buffalo, in an address delivered before the members of the Association of Electric Vehicle Manufacturers, the text of which is herewith presented:

It is no hardship at all to introduce electric vehicles. It doesn't take long to prove that they are as much superior to the horse wagons as the tram-car is to the horse-car or the electric light is to the candle. We can enthuse a man in short order. But the problem which he throws at us, and the one we must grapple with, is how and at what expense will his vehicle be maintained.

At the present time those electric lighting and power companies have got a high lighting peak, a rising load from the afternoon on, and they are absolutely ignorant as to any market for their night load. They are spending a great deal of money advertising, promoting and disseminating information as to the uses of electric current in the day time. They are spending thousands of dollars, many of them, promoting the electric heating iron, the curling iron, the massage iron, so as to sell their current in the day time, but from six o'clock at night to midnight they have practically a dead line.

Now the reason electric light currents are so high is because they have got to average up on the twenty-four hours. When I presented the idea of a market for current between midnight and six o'clock for the charging of electric vehicles, I received a most agreeable welcome. I don't mean to say this braggingly, because others have no doubt done the same thing. I am quoting my own experience. I succeeded in getting them to name in the place of twelve cents for light and eight and ten cents for power, a price reduced as low as six, and in some cases as low as five and four, and in one case three cents, and getting them to waive their minimum charge rate and make a flat rate of three cents for charging electric vehicles during those hours. That makes the proposition very attractive. It lifts it from an absolute blank to a definiteness. What an advantage to be able to say to a man: "Why, yes; we will provide you current at three cents a kilowatt. You can get it, and get it right in your own factory." I could go a step farther and say that a great many of these electric companies, having horse vehicles, can be induced to exchange them for electric vehicles. They will next require a garage of their own, and I think it will be but a step after that to get them to garage vehicles publicly. The Philadelphia Electric Light Company has gone into this thing extensively. It has garages for its twenty-four vehicles and is planning to build two more shortly, and is willing to take vehicles from the public. The New York Edison Company, I understand, has fifty vehicles, and has contracted for 25 more, and is going to enlarge its garage. Its policy is different from that of the Philadelphia Company. It wishes to retail current through jobbers and to encourage the dealers to establish electric garages. In Chicago, I believe, the experiment has been tried both ways. In Pittsburg the Allegheny Electric Light Company has gone into the question very thoroughly and probably will establish a large central garage. St. Louis is alive to the situation and the Union Gas & Electric Light Company has built a large garage. All over the country, in large and small places, the same interest in the electric vehicle is being shown by the central stations.

* * *

These observations of Mr. Macnaughtan were supplemented by a short address from H. H. Rice, manager of the Pope Mfg. Co.'s electric vehicle factory at Indianapolis, who described with interesting minuteness the method by which two employes of a central lighting station persuaded their superiors that selling current for automobiles was a business capable of very considerable development and profitable alike to seller and buyer. Mr. Rice said:

A couple of young men in the lighting company, who had reached about the limit of salary for the work they were doing, asked their employer if they could sell electric vehicles and were given permission to do so, and incidentally to get customers for the current. They succeeded in getting a fairly low rate for the current, which happened to be direct, at 110 volts, and as they sold vehicles they installed small rheostats in the barns or special sheds which were erected, and in some cases underneath the front porch of a man's house, where he could run in at the side if it happened to be high enough. All of those vehicles are charged by the owners, in some cases by women. In one instance a woman 70 years of age takes entire charge of her vehicle except that every two weeks or so the electrician of the electric company has one of his men inspect it. A card index of these vehicles is kept, and notice is issued every two weeks to owners to have them brought to the station for examination. Every two weeks is sufficient. The batteries are then examined and cleaned if necessary, and the customer is notified when it is necessary to clean it again, and if it is necessary to clean it then the cell is cut out and the work is done. Now those customers are getting their current for an average of $4 per month and they run their vehicles all they want to.

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Testing Non-Skidding Devices

Severe Trials to Ascertain if Heavy Vehicles Can be Prevented From Skidding

OUT of forty-one devices intended to overcome a heavy motor vehicle's tendency to skid on greasy streets, and submitted to a committee of the Automobile Club of Great Britain for examination and special test, only seven were considered to possess sufficient merit to be fitted to motor buses and given an extended trial covering 1,000 miles. An examination of the drawings was enough to disbar many from the competition. Sanding devices, trailing wheels and resilient wheels were excluded, leaving the field to loose metal rings, floating metal rings, three pairs of wheels (back and front steering), rubber studded iron tires, tires with rubber blocks multi-sectional in direction of rotation, tires composed of rubber and leather rings, and floating metal rings with loops.

The preliminary tests took place over specially prepared ground, spread first with half a ton of soft soap and overlaid with mud to a depth of six inches. The proving ground was slightly inclined. The conditions of the first tests were as follows:

1. Each vehicle had to run straight down the track, brakes being applied at a given signal.

2. Each vehicle had to run down the track inside a course marked out with flags to represent sharp turns which it would be necessary to make in passing other vehicles.

3. Same as the second condition, but including sudden application of the brakes.

* * *

It will be at once perceived that the nature of the surface and the conditions of test were very much more severe than would be encountered in ordinary service. There was too much grease and too much mud on the track. No doubt the elimination of sanding devices and trailing wheels was due to the presence of such an extraordinary quantity of slime.

The following observations of a representative of the "Industrial Motor Review," who witnessed the trials of the seven devices which emerged successful from the preliminary tests, although obviously not intended to forestall the verdict of the judges, enable us to compare the performance of one device with another and note which acquitted itself with most credit:

Loose metal ring.—Developed bad skidding and side-slip propensities.

Floating metal ring.—Very good on the first test, but bad on second and third tests.

Six-wheeled device.—Skidded and side-slipped on brake in first test; fair in second test, but better with increased weight; very good in third test.

Rubber studded iron tire.—Skidded and side-slipped badly.

Rubber blocks, multi-sectional in direction of rotation.—Excellent in first test; some side-slip, but no skid practically in second test; same on third test. This vehicle traveled very fast in second test; the absence of skid was very noticeable; when starting off after pulling up on the brake the driving wheels did not race or skid.

Tire of rubber and leather rings.—Very fair on the first test; bad on second test; fair on third test. Trouble was caused by the skidding of the front wheels, and it is doubtful whether the projecting leather rings will last very long. The leather rings retain grit, which assists the non-skid properties.

Floating metal ring, with loops.—Much side-slip on first test; front wheels skidded on second test; side-slipped very badly on third test.

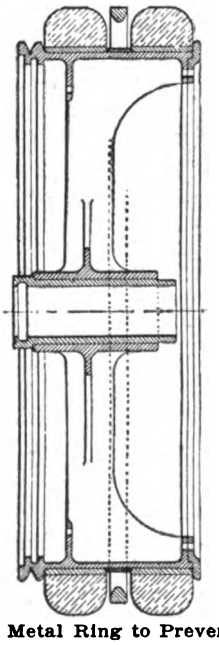
* * *

Descending to particulars of the devices which passed the preliminary test we find that the loose metal ring device consists of a ring placed between twin tires. When side slip starts the tire rides on the beveled portion of the ring, forming a wedge between tire and road. Tire and ring wear equally.

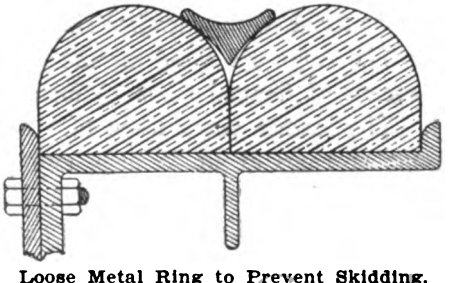
The floating metal ring device also consists of a steel ring placed between twin tires. The tires are compressed against the ring and silence it as the vehicle travels.

The six-wheeled device aims to maintain rolling contact between the wheels and road by supporting part of the vehicle's weight on free wheels which are not acted upon by engine or brake, but which are guided by the steering gear in conjunction with the front wheels.

The rubber studded iron tire is a pneumatic stud or air-spring tire for which no pumping is required. The studs in their normal condition when fitted on the wheel



Floating Metal Ring to Prevent Skidding.



Loose Metal Ring to Prevent Skidding.

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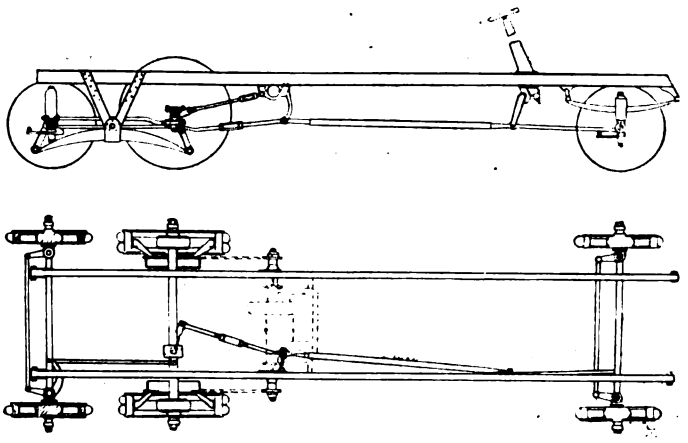
have beneath them confined air spaces, where the air is at its normal density, but when weight is put upon them the air is compressed to a pressure of four or five atmospheres. The rubber is made in flat strips with projecting knobs, under each of which is a recess or air space. The rubber is inserted in a perforated steel, boltless rim, with holes to receive the studs, so that the only part of the rubber which projects beyond the steel is the stud heads, the necks of which are forced through the holes in the perforated steel rim under compression. When this has been done the bases of the air spaces are closed by the insertion of steel discs or washers, some of which are tapped so as to take the screw ends of bolts. The steel rim, with rubber, is then forced over the flat ordinary steel tire or binding rim of the wheel under compression, thereby making the air spaces air-tight compartments, with the perforated steel rim practically floating on the rubber and not being connected by any bolts or screws to the wheel proper. When the tire has been so forced on to the wheel, a few bolts are passed through the felloes and the binding rim and screwed into the tapped washers. The advantages claimed for this mode of construction are:

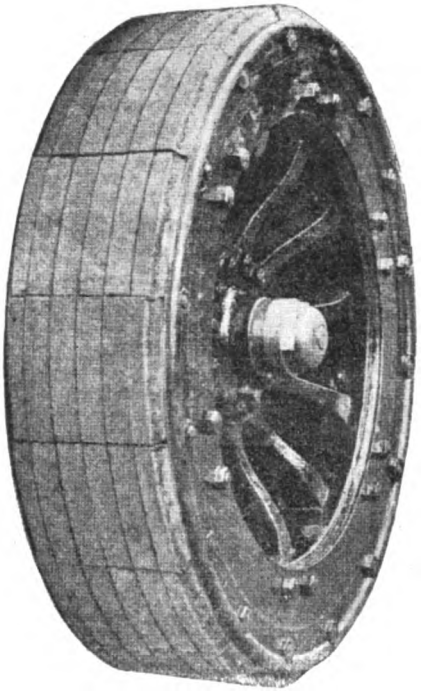
(1) Every part of the rubber when attached is elastic and has room to spread, and no part of it is so gripped that it cannot spread, so that no lamination or disintegration takes place between the part of the rubber which is gripped and the part which is not; (2) the rubber is always in its natural state, except the part which is in ground contact, and no part of the rubber is ever stretched when in use; (3) When the rubber comes into contact with the ground it is contracted within steel walls, and is not stretched, with the result that it is very much more difficult to cut than is the case with other tires, it being a well-known fact that it is easier to cut rubber when stretched than when contracted; (4) should from any possible cause any stud be unduly injured or worn out, it can be readily and simply replaced by a new stud without discarding the rest of the rubber; in other words, the tire can be patched.

The chief advantage of the multi-sectional rubber block tire, which was extensively described in this paper some months ago, resides in the system of creating several independent rubber tread surfaces in contact with the road at all times, the result being that all mud is squeezed from under the surfaces to the interstices between the rubber tread blocks, and ensures a practically dry road surface. The mud is squeezed out as soon as road pressure on the tire is removed by the upward revolution of the wheel.

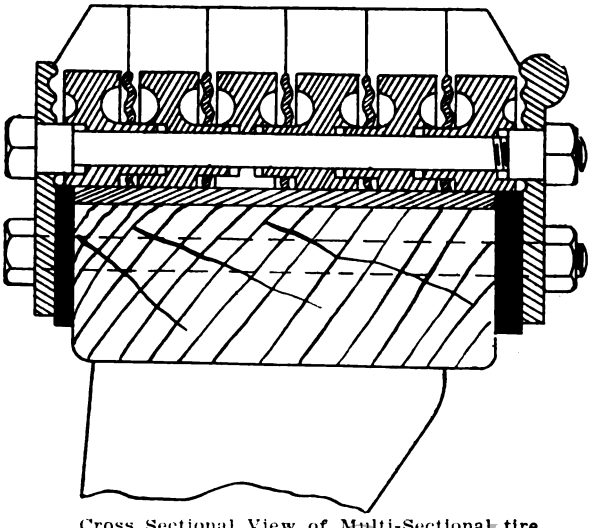
The rubber and leather tire is made of alternate layers of each material, with a leather ring outermost on the off side. The rings are fitted around the wheel and fastened by means of flanged rings ¼ inch thick and 4 inches deep. The leather rings when first fitted project beyond the rubber rings about ¼ inch, and are ¾ inch thick. The rubber rings are ⅝ inch thick. The leather rings are composed of strips of leather strongly sewn together, the stitching being below the line of wear.



Free Wheel Device to Prevent Skidding.



Multi-Sectional Tire to Prevent Skidding.



Cross Sectional View of Multi-Sectional tire.

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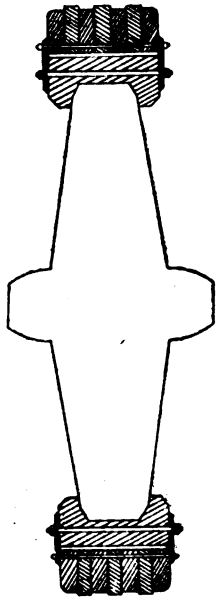
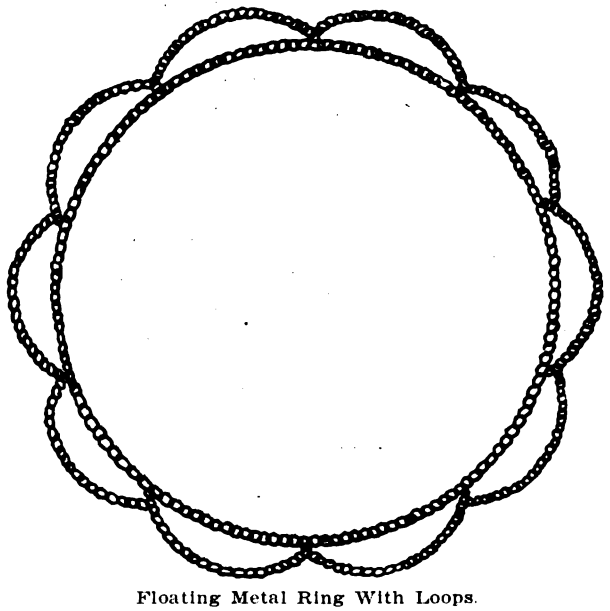
The floating metal ring (wood lined) device consists of an endless chain, lying between the twin tires, to which is attached loops of chain.



Composite Leather and Rubber Tire.



Floating Metal Ring With Loops.

The illustrations describing these devices are presented through the courtesy of "Motor Traction."

The six-wheeled Renard train is to be introduced into Great Britain. This is undoubtedly one of the most interesting self-propelled vehicles of modern times. It consists of a light tractor with a train of vehicles so arranged as to carry either passengers or merchandise. Its construction and operation has already been fully described and illustrated in this paper.

Considerable stir was recently caused when it became known that the King of England had ridden in a public motor cab to keep an appointment, his own chaffeur not being available at the moment to convey the ruler in one of the royal vehicles.

GASOLINE MOTOR AMBULANCE

THE commissioners who administer the affairs of the workhouse and hospital in the county in which Chicago is located have purchased a gasoline motor ambulance to be delivered later at a cost of $2,500. They now want a motor wagon for hospital "pickup" work, expecting that its employment will do away with the necessity for keeping six horses.

The adoption of the motor ambulance will facilitate the removal of the sick from the county hospital to Dunning. At present it takes several hours to cover the twelve miles between the two institutions and requires one team for the day.

NOVEL MOTOR FIRE VEHICLE

THE vehicle which carries the extension ladder of the Hanover fire department is an interesting piece of mechanism. It is operated by two electric motors placed in the front wheels, current being supplied from an 80-cell battery. The speed of the vehicle is from 12 to 15 miles an hour. The travel range is about 15 miles. There are five forward speeds and two reverse. Hand and electric braking are employed. The weight of the vehicle is 15,250 pounds. The crew consists of one driver and four attendants.

The length of the vehicle is 23 feet. Its height in front is 10 1-2 feet, and in the rear 8 feet 10 inches. The front wheel gauge is 51 inches, the rear wheel gauge 69 inches. The ladder, in four sections, is raised by power contained in tanks of carbonic acid gas under high pressure. It can be rotated about its vertical axis without moving the vehicle.

SOME SOURCES OF TIRE WEAR

DOUBTLESS the wear of solid rubber tires is greatly augmented by the too free and rough use of brakes. It is the opinion of most of the administrative engineers attached to large motor bus operating companies, that if drivers would apply the brakes gently and with circumspection, a tire, on these seven ton vehicles, would uniformly last for 20,000 miles.

The tendency of drivers to use the tracks of street railways is another fruitful cause of wear to solid tires. Commonly the pavement is lower than the rails; and when a motor vehicle is obliged to cross the tracks at a small angle the tire fastenings are sometimes wrenched or broken, the rubber is subjected to severe wear, and skidding, which puts great strain upon the frame and working parts, generally takes place.

Hamilton McK. Twombley, a rich man whose estate is located near Madison, N. J., uses motor wagons to deliver milk supplied from his model dairy.

It is expected that a motor stage line will be operated between Amarilla and Tucumcari, N. M. The success of the Roswell-Torrance line has stimulated the projection of many such enterprises in the Territory.

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Milwaukee's Mail Wagons

Further Descriptive Particulars of the Machines Employed in the Cream City's Postal Service

SOME further interesting particulars of the steam mail collecting wagons used in the Milwaukee postal service are now available. The vehicles are employed in gathering letters, parcels and newspapers from the more remote parts of the city.

By the terms of the contract under which the wagons are operated the Johnson Service Company, the makers, guarantee their efficiency and punctuality in service. The Johnson company also owns the vehicles, two of which are being operated ten hours a day, while the third is kept in reserve for emergency work. It is stipulated in the contract that the company is to provide drivers for the machines. The sum of $4,000 is granted for the maintenance of each vehicle, an allowance so liberal as to leave no room for doubt concerning the genuineness of the postal department's desire to wholly supersede the present horse wagon service. It must not be understood, however, that the sum represented by the difference between the operating cost and the annual allowance is all gain. The cost of the vehicles, their maintenance, charge for depreciation, stabling and executive administration have to be considered. It is not likely, therefore, that the actual profit will be large, although it is impossible to believe that none will be shown.

Each wagon is 15 feet long, over all, and weighs a ton and a half. At the front is the driver's seat, protected by a glass front and adjustable side curtains. Steam is the motive power and kerosene is used as fuel. The wagons are capable of a speed of 35 miles an hour.

The mail compartment is entered from the rear and is provided with double sliding doors. Large car windows are provided at each side, and the skylight has hinged ventilators. The interior of the wagon is 5 feet 6 inches long, 4 feet 6 inches wide, and 5 feet 9 inches high. Along the right side of the compartment is a rack similar to those used in railroad mail cars, which will hold four mail sacks. Along the left side and front is a table upon which are trays for holding the mail when sorted. Six trays are used for the ordinary No. 6 envelopes, and two rows can be placed in each. Six trays are used for the large or legal sized envelopes. On making the collection the clerk will sort and "face" the letters in the trays ready for the stamping machines.

The rails between the rack and the table are heavily padded with leather to protect the clerk against minor bruises through unexpected bumps or lurches of the machine. The cab is equipped with a radiator heated from the exhaust, and in the summer time this will be covered with asbestos. A thermometer and a brass clock are also provided. The interior is lighted by an acetelyne lamp.

The outside of the wagon is handsomely painted in dark blue, with white panels, and the side and rear panels bear the words "United States Mail" in red and gilt letters. On the panels of the seat the monogram "U. S. M." is dlsplayed in the same colors. The running gear and footboards are red, and the driver's seat is upholstered in black leather.

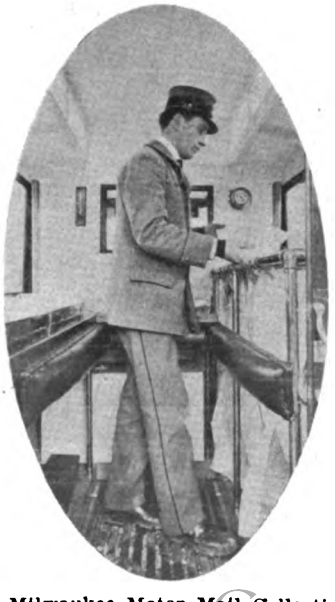
Experiments have shown that the average length of time required for a man to leave the machine, "tap" a mail box and re-enter the car is 10 seconds, and it is expected that the two machines will collect a large amount of mail daily.

As soon as the third machine is finished the Johnson Service Company will commence building three more wagons to be used for delivery of mail between the main postoffice and substations. These will be lighter and will have no racks inside. They will be covered with wire screening, similar to that of the old fashioned wagons. The mail between these points is already sorted, stamped, tied and sacked, and the rear part of the machine will be merely an open wagon box, although in general outlines, the wagon will be similar to those now in service.

MOTOR MAIL WAGONS FOR SEATTLE

THE postmaster of Seattle, Wash., will attempt to secure motor wagons for the collection of mail in that city. In a short time the head of the department of salaries and allowances will visit that city and the Seattle postmaster will take the matter up with him. Up to the present time the postoffice department has opposed the move on the ground that the streets of the city are too hilly, but it is expected to give the visiting official from Washington a demonstration that will remove this false impression.

Twenty motor buses will soon be operating between Lyons and Estes Park in Colorado over a road which is being built at a cost of $50,000.



Interior of Milwaukee Motor Mail Collecting Wagon.

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BUS LINE FROM MACON TO WASHINGTON

AN enterprising citizen of Charlotte, N. C., is engaged in promoting a company to operate motor buses between Macon, Ga., and Washington, D. C., via Atlanta, Greenville, Spartanburg and Charlotte. Connection will be made at Atlanta with a similar line from New Orleans. He claims that a large number of tourists would take such a line in preference to traveling by railroad if they could travel over good roads. He has presented his project to the officers of the states and counties through which the line will pass. So far most of these have shown themselves to be interested in the enterprise. The magnitude of the undertaking, however, will prevent its early realization.

FIRE UNDERWRITERS' MOTOR VEHICLES

A motor vehicle employed in the service of Cincinnati's fire underwriters salvage corps, which has been in service since August, 1905, has many meritorious performances to its credit. The machine, a 50 hp. Winton, cost $3,500 completely equipped. It carries a crew of nine men, thirty tarpaulins 14 by 18 feet in size and weighing 35 pounds each, two Babcock extinguishers, four big scoop shovels, a dozen brooms and two smoke hoods supplied with compressed air. The speed of the machine gives it a big advantage over the horse wagons which the corps employs in the same service. All the heavy and outlying work is performed by the motor vehicle, the horse wagons only making short runs on level ground. The cost of maintaining the two two-horse drawn wagons for the year ending with March 1, 1907, was $1,980. During the same period the cost of maintaining the motor vehicle was $2,075. It must be remembered, however, in considering these figures that the motor vehicle attended all fires including those remote from the salvage corps station, while the horse drawn wagons only put in an appearance at close by fires.

Harrisburg, Pa., business men have given their support to a project to operate a line of motor stages on Third street, in that city, from Reel's Lane to the union station.

Motor bus service will soon be afforded between Lakeport and Hopeland, Cal. The owners of the Highland Springs toll road will spend $7,000 lowering the grades and straightening the highway. It is planned to extend the serivce later to Upper Lake and Kelseyville. The company will operate four buses which will carry fourteen passengers each and their baggage.

Three motor buses have replaced five horse-drawn buses in service at Tuxedo Park, N. Y., between the railroad station and the hotel.

A $120,000 company has been formed in France for the purpose of operating public motor vehicle services. Fifteen lines will soon be started.

TO EXTEND MOTOR STAGE SERVICE

IF the business men of Albuquerque, New Mexico, will pledge themselves to reimburse Mayor Stockard of Roswell, who controls the automobile passenger, express and mail line between Roswell and Torrance, the latter will expend $8,000 in the construction of a special highway and guarantee double daily service as far as Albuquerque. The extension of the line means a twelve-hour connection between Albuquerque and the rich and populous Pecos Valley.

Mr. Stockard's present route between Torrance and Roswell, 110 miles, over which a double daily service is maintained, is built much like a railroad, the company having its own right of way. Cattle guards are built at all the fences, fills are made, and arroyos bridged. Mr. Stockard now has a force of men at work on the preliminaries of a telephone system which is going to follow the automobile route.

If Mr. Stockard's proposal is accepted the extended route will pass through a region of much scenic beauty. Willard and Torrance will be made the principal stations. Branch lines will run to Estancia, Moriatry, McIntosh and other Estancia valley points. The service to the Estancia valley will be especially valuable to local business and traveling men. Mail privileges will naturally go with the operation of the extended service.

In the carrying of mails between Roswell and Torrance a very remarkable success has been achieved for the motor stage. For seven months and fourteen days the service did not run behind time on a single day, and much of the time the motors came ahead of schedule. Since the line was started the stages only missed four and a half trips, during the heavy snowstorms and blizzards of last fall, when they got stalled in snow over the wheel tops. The passenger service is being steadily improved. The highest record is thirty-six passengers one way in one day, a feat accomplished with three or four machines some months ago. Six machines are in use all the time. One is stationed at the half-way house, and if for any reason an automobile fails to show up the reserve car is started out to the rescue.

During the first year the company owning the Roswell-Torrance line paid 30 per cent dividends.

The Sarnia Automobile and Bus Company, of Sarnia, Ont., has been organized, with capital stock of $40,000, to operate public service motor vehicles.

Capitalists are financing a company to operate a motor bus line between Kokomo and several small towns in the neighborhood.

A gasoline public motor cab, operated by a woman, is one of the curiosities of Paris.

German motor cab fares have been considerably increased of late.

In Paris motor buses are taxed $400 yearly.

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MOTOR BUS AMALGAMATION

DETAILS of the conditions upon which four prominent motor bus operating companies in London will federate their business interests are now known. They differ materially from the conjectures published a few months ago, when the scheme for amalgamation was first suspected, but not given official confirmation.

The four companies to be combined are: The London Motor Omnibus Company, the London & District Motor Bus Company, the Motor Bus Company, and the London & Provincial Motor Bus & Traction Company. These establishments will be reorganized and their joint business capitalized at $5,000,000, the dominant factor in the amalgamation being the interest represented by the London Motor Omnibus Company, operators of the "Vanguard" buses. In explanation of the consolidation the directors of the controlling company say to their stockholders:

You will remember that this company has a friendly working arrangement with the three other companies in regard to routes, which so far has not been given much effect in practice. The three other companies are now running motor buses in London, and are likely in the near future to considerably increase the number. The conditions of running motor buses in London have recently changed, and the increasing stringency of the requirements of the police and local authorities, and the greater necessity for reliability and excellence of running of the buses, led us to favorably consider a combination of the other working companies with ours. We are of opinion that an amalgamation of the four important interests in question will not only conserve existing adavantages, but also increase the aggregate earning capacity, effect considerable economies in repairs, maintenance and administration, and generally tend to more effectual management and control. We also consider that the rights of the respective companies will be better and more effectively assured by a combination of the interests of the four companies in a larger and more influential company, than is possible under existing conditions, where conflicting claims may often render active and complete co-operation difficult, if not impracticable. For these reasons, and in the general interest of a new industry, which has, in spite of many difficulties, already proved a boon to millions of persons to whom a cheap, expeditious and convenient mode of conveyance is a necessity, and who look forward to its further improvement and development, we confidently recommend the proposed scheme of amalgamation to the favorable consideration of the shareholders.

The issued capital of the new company is not to exceed $3,952,500, consisting of 465,000 shares of 7 per cent preferred stock at $5 a share, 325,500 shares of common stock at $5 a share, and bonds to the extent of $1,000,000.

The commercial club of Walla-Walla, Wash., is considering the establishment of a motor stage line between that point and Dayton. The merchants complain that they lose much business as Dayton customers cannot reach their natural market and return in one day.

Business men of Bryan, Texas, have announced their intention to operate motor buses between that point and College Station if the project to construct a trolley line falls through or is too slow in materializing.

ELECTRIC VEHICLES IN SNOWY WEATHER

THE recent heavy snowstorm which visited the eastern states put a severe strain on all systems of traffic. In the cities the most serious interference was felt by horse-drawn vehicles. Ten inches of snow makes hard pulling for a heavy truck, so that blocades are frequent on busy streets. Moreover, on those streets where smooth, wooden or asphalt pavements have been laid, as is true of many streets in New York City, when the snow was cleared away the slippery film of snowy ice formed made it difficult for the horses to get any hold. For this reason probably more trouble was experiences in such places, even though the pulling was easy, than where the snow still remained.

These conditions brought out very clearly the superiority of mechanically propelled vehicles for city purposes. The large electric and gasoline trucks seem to have no difficulty in getting around. On the cleared streets running was easy, and even where the deep snow remained they went through apparently without much additional effort. It frequently happened that a vehicle of this kind was able to clear a block, due to a stalled horse-drawn truck. In this way the electrically driven vehicles did particularly good work, as might have been expected from the peculiarities of these vehicles. The electrically driven truck is under better control than any other type of vehicle. It can start slowly and graduate its acceleration as desired, and the turning effort is greatest at the start. The machines are thus able to meet most successfully the strains due to heavy snow, and it was reported by one of the largest garages that they showed no effects of the increased strain, except a somewhat increased rate of battery discharge. The large vehicles could not travel as far as under more favorable conditions, but they suffered in no other way. The lighter vehicles, with a little additional charging in the middle of the day, were able to cover nearly as much ground as usual.—*Electrical Review.*

At the next French industrial motor vehicle trials, scheduled to be held from May 20 to June 10, the fastest speed permitted will be 16 miles an hour and the minimum speed 5 miles an hour. The minister of war has promised to purchase a number of the heavy service vehicles which emerge successfully from the trials.

The Delaware Valley Transportation Company, which operates a passenger motor car service between Port Jervis and Milford, N. Y., reported gross earnings last year of $6,367, and net earnings of $1,532.

An order is pending for the purchase of ten motor vehicles, to cost $10,000, to the Chicago Fire Insurance Patrol.

The General Omnibus Co., of Berlin, has ten motor bus lines in operation.

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ALCOHOL ENGINES

DISCUSSING the future of alcohol engines Professor Elihu Thompson, the well-known electrical expert, recently took occasion to say:

"In the case of denatured alcohol, which it is hoped may become available at a reasonable price before long, the same form of vaporizer as that used with gasoline will satisfy the conditions, except that it will receive a preliminary heating so as to confer upon the alcohol vapor the same degree of volatility as is possessed by gasoline at ordinary temperatures. In the same way, by raising the temperature of the vaporizer still more, it is quite possible to use liquid fuel of much higher boiling point, and even kerosene oil. I have, in fact, repeatedly run an engine with the vaporizer arranged to have its temperature controlled, and employed gasoline, alcohol and kerosene oil interchangeably. An engine starting cold with an arrangement for allowing the exhaust gases to heat the vaporizer may burn a small amount of gasoline at the start, and on the attainment of temperature sufficient to vaporize alcohol, the alcohol may be gradually turned into the vaporizer, and if the arrangement is such as to still further increase the temperature of the vaporizer, kerosene oil may finally replace the alcohol. But it is hoped that it will not be necessary to go so far.

"It will doubtless take considerable time, possibly two, three or more years, before the arrangement or organization for the production and distribution of the denatured alcohol is sufficiently perfected to give us the product at a price which will compete with that of gasoline in the denser populated districts where the methods of distribution of the oil products are already in a high state of development. In the more sparsely populated districts, however, where, on account of the distances for distribution, and inconvenience of storage, gasoline now commands an advanced price, it should not be long before denatured spirit should be able to compete.

"Denatured alcohol will contain from 5 per cent to 10 per cent of water, and in the writer's experiments there was a tolerance of 15 per cent to 20 per cent; or in other words, about 80 per cent alcohol could be used. Below that point the ignition became somewhat irregular."

National Cash Register Company's Garage

LACK of local railroad shipping conveniences makes it necessary for the National Cash Register Company of Dayton, Ohio, to give extensive employment to the power wagon in hauling its merchandise and supplies to and from railroad depots, which are from one and a half to three miles distant from the company's plant. Eighteen months ago a 5-ton electric truck was installed. A year later two 3½-ton electric trucks and another 5-ton electric machine were bought. These last mentioned vehicles were supplied by the Studebaker Company. All four trucks, together with four motor cars used by the company's executive officer's, are housed in a building built of brick and concrete, 75x125 feet. Two men are employed to look after the trucks. One goes on duty at 6.00 a. m., and the other at noon, the latter charging the batteries. The motor trucks perform the work of twelve two-horse wagons and eight drivers and as they are operated steadily, represent a very handsome economy. Occasionally the 5-ton trucks carry a three ton overload, and the 3½-ton trucks are often called upon to carry five ton loads. The work of these vehicles practically consists in transferring raw materials and supplies from railroad depots to factory and carrying finished product back to the depots. Full loads are common. Light loads, that is unprofitable loads, are rare. The vehicles therefore are admirably adapted to the service in which they are employed, which is the first law for successful operation of motor wagons. To facilitate loading and unloading, two men from the factory are kept at each of the freight stations. The daily average of each truck is from twenty-five to thirty miles. The usual speed ranges from four to eight miles an hour. On the five-ton trucks seven-inch solid rubber tires are used, both front and back. On the three and one-half ton trucks five-inch tires are used in front and six-inch tires in the back. The tires that were on the truck purchased eighteen months ago are still in use. Batteries are charged at night.

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THE HORSELESS TOWN

ON very hand the passing of the horse from city service is hailed with a welcome and predicted as an economical necessity. That is to say, wherever his inferiority to the motor car and motor wagon is demonstrated. Some recent opinions on this subject are appended:

Hope is first cousin to prophecy—and prophecy beholds the city of the future coursing in its interlaced thoroughfares with the swift, red corpuscular life of the motor. Every glistening vein and artery is seen free of the dirt tracks of horse and grinding wheel. The smooth pavements of the boulevard feel only the flying pressure of the pleasure car—the wooden blocks of the highways bear the noiseless weight of giant freight-bearing trucks. Against the force of engines and steel the puny horse cannot be expected to pull. Today we admire the tense strength of the team that conquers by main effort its heavy load, but thew and sinew will quiver in vain under competition with the motor truck. Once the city smoothens the path for it, the freight automobile will glide into its inevitable place in commercial traffic. But it is too soon to lament the horse. We have not yet come to the day when we must decide whether we are to pet him, as the dog, or eat him, as the amiable cow. Our sentiment for the noble beast will remain, and with the heaviest work undertaken by insensitive strength his lot will probably be improved. —*Chicago Post.*

While the pleasure world is inspecting the many different makes of touring cars in joyful anticipation of the coming spring, business men are daily concentrating their thoughts and considering the advisability of adding a few delivery wagons and trucks to their equipment. Slowly but surely the commercial motor car is coming. Motor wagons would be more in evidence if touring car manufacture did not engross so much attention. However, some manufacturers have foreseen the great future of the commercial car and are turning out a product which is practical, serviceable and economical. We may say that the touring car is a money spender, but, on the contrary, the commercial car is a money earner.—*Boston Journal.*

ELECTRIC MAKERS RE-ELECT OFFICERS

AT the annual meeting of the Electric Vehicle Manufacturers' Association which included all of the electric business wagon makers, all of the old officers were re-elected as follows: President, George Pope, Pope Manufacturing Co., Hartford, Conn.; vice-president, George N. Studebaker, Studebaker Automobile Co., South Bend, Ind.; treasurer, M. L. Goss, Baker Motor Vehicle Co., Cleveland, Ohio; secretary, Robert McA. Lloyd, General Vehicle Co., New York. C. E. Firestone, of the Columbus Buggy Co., and C. F. Eberhard, of the Williams Electric Vehicle Co., were added to the board of directors.

The postal authorities have decided to give motor mail wagon service to Detroit and Louisville.

The Light That Failed

EAGER as the postal department now is for the general employment of motor mail vehicles, there was a time about five years ago when its ardor for their use was effectually cooled as a result of a disastrous experiment made in Minneapolis. It seems that the Minneapolis postmaster, attracted by the possibility of improving the service by the employment of motor wagons, entered into a contract for the use of five electric vehicles which it was expected would take the place of all horse drawn vehicles employed. Only two of the five electric vehicles were put into commission. They were of local manufacture and from the very outset proved to be underpowered. Moreover they were clumsily designed and much heavier than well-constructed electric vehicles of the period. Failure was inevitable. The backers of the company, perceiving that the first two machines were not working satisfactorily, declined to advance further sums of money and as a result the enterprise collapsed. The route which the two commissioned vehicles had to cover was not particularly difficult. It was ten miles in length and contained 55 stops. It was covered in an hour during the two weeks in which the motor vehicles were operating. About $15,000 was lost in this ill-advised manufacturing venture. In an official report made to Washington by government engineers it was stated that the time was not ripe for carrying mail by motor wagons. Doubtless this expression of opinion was accruate at the moment, It would be interesting to know, however, how much money has been wasted in carrying mail matter by horses and wagons since the period when first the economy of the motor wagon was demonstrated, which period, by the way, so far as the mail service is concerned, was almost contemporaneous with the time when the failure just described took place.

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Gasoline Wagon Operation

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

MOST gasoline wagon drivers seem to think that the more current flows from an ignition storage battery the better and faster the vehicle will run. This, of course, is absolutely wrong. While it may be true that the spark will be much fatter and hotter, this does not say that it is in any respect beneficial; on the contrary, it is detrimental to the battery, as same will run down very quickly; the platinum on the vibrators and on the vibrator screws is consumed rapidly, not to speak of the "sticking or freezing" of the vibrators when misused in such a manner; the points on the spark plug fuse and are eaten away very soon, so that the distance between the points increases, which in time makes it necessary to apply a stronger current.

To Stop Cylinder Encrustation

Sooner or later an engine becomes foul through the formation of a hard carbon deposit upon the top of the piston and upon the surface of the combustion chamber. Some engines are much more sensitive to this deposit than others and, speaking generally, it may be said the higher the compression the sooner it becomes necessary to remove the deposit. This is by no means an easy job. In the majority of cases it means drawing the pistons or taking the cylinders off. At the same time, when the deposit attains a certain thickness something must be done, as the compression gets so high that premature firing is occasioned, and not only so, some portions of the deposit itself become so heated that the engine may go on firing more or less irregularly after the current is switched off. The long and short of it is, with a very few exceptions, the removal of the deposit means the pulling down of half the engine, and it is, therefore, a procedure which is well worth avoiding if possible. The deposit can be stopped by the use of plumbago, coating the top of the engine piston and the combustion chamber (after thoroughly cleaning them) with ordinary plumbago mixed into a paste with gasoline.

How to Adjust a Spark Coil

A careful investigation of 100 so-called ignition battery complaints led to the discovery that more than 90 of them were caused solely by the adjustment of the spark coil. A half turn of the adjusting screw on a coil will often increase the current required by the coil from one-third of an ampere up to an ampere and one-half, or nearly five times the actual amount of current required. The first thing the average driver does when his wagon is not acting right is to change the adjustment of the coil, and then, when the battery falls down, he blames the battery when the fault is elsewhere. A wrongly adjusted coil causes short life of the batteries, burned contacts on the coil, poor running of the motor. Adjust the coil properly and then do not let any one change the adjustment for any reason whatever. Remove entirely the vibrator contact screw. Then adjust the vibrator spring so that its end stands normally about 1-16 inches from the end of the coil. Now screw in the contact screw until it just touches the platinum contact on the vibrator spring. Be sure that it touches, but very lightly. Now start up your engine; if it misses at all, tighten up, or screw in the contact screw a trifle further—just a trifle at a time, until the engine will run without missing explosions. If your carburetor is properly adjusted and your winding is in good shape, your coil will give a quick action and ample spark with the smallest possible consumption of battery energy. Insist upon a coil of reliable standard make. There are coils made which take an enormous amount of current.

To Repair a Broken Spring

While it is generally more advantageous to replace a broken spring section than to attempt its repair, it occasionally happens that an effective temporary repair can be made to a leaf, which will avoid the necessity for putting the wagon out of commission while waiting for the arrival of a new leaf. Heat the broken parts, at the point of fracture, being careful not to get too hot, as a high grade steel spring will sometimes fly in pieces if heated too much. Hammer to a taper of at least ¾ inch, being sure you have lengthened the piece half as much as you have tapered it, i. e., ⅜ inch, and anneal by allowing to cool gradually. Having prepared both fractured ends so they will lap and make a good joint ready for welding, place them together so the leaf is $\frac{1}{16}$ inch shorter than it was before breaking, as it will stretch a little under the hammer. Drill a small hole through the joint, putting in a rivet to hold joint in place. Now heat to the welding point and apply borax to the joint. Commence striking as soon as possible after taking from the fire. Do not attempt to restore temper by fire and water, but hammer it in until the steel is cold. If you have been careful not to overheat, and sure that no scale has been left in the joint previous to welding, and have hammered sufficiently with many light blows to get the temper back, you will have a repair that should stand ordinary road shocks for a long time.

A Stiff Running Engine

Cold weather may affect the lubricating oil after a wagon has stood idle over night. Therefore it is well to carry a squirt can containing kerosene. If the motor starts hard, cannot be cranked with a swing, or runs stiff and does not give its usual power, a teaspoonful of kerosene squirted through the petcock or spark plug opening, whichever is the more convenient, will in the majority of instances remedy the trouble.

If one did not know the western farmers are freely buying automobiles it would occasion surprise to learn that hauling wheat from field to mill was a common function of such machines in Kansas last fall.

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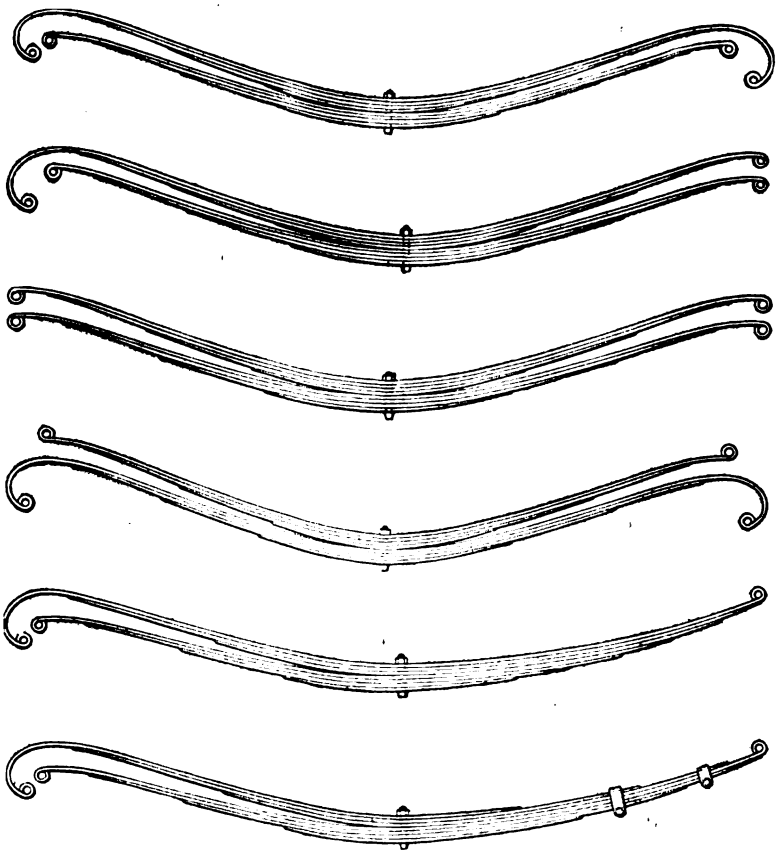
Information For Buyers

Perfection Spring Suspension

SO long as spring makers persisted in adhering blindly to the traditions established through centuries of horse-wagon building there was slight hope that motor wagon spring design would be greatly advanced. However, the moment it was realized that automobile traffic presented problems in suspension not heretofore encountered, they rose to the occasion and sought to adjust their art to the new conditions.



Anyone who has ridden in a motor wagon and felt the shock which resulted when the vehicle met a street car track or other obstruction does not need to be told that automobile springs as now constructed fail conspicuously to do their work. The reason for this failure has been that the ordinary type of spring construction, while meeting the requirements of a horse-wagon spring, was entirely inadequate both in quality of material and design for the wide variation of conflicting conditions under which automobiles are run. A speed varying from four to twenty miles an hour, over all kinds of road surface, and a load that varies at different times, embodies a problem of spring construction that was entirely unknown before the day of the automobile. To carry a heavy load requires a very strong spring, or it will break or bend out of shape when it meets an obstruction. In ordinary spring construction the only way to make a spring strong has been to make it heavy and stiff. This, by the way, is exactly the kind of spring automobile manufacturers have been forced to use, their choice in the matter, until lately, being limited to what the market or spring designers afforded.

The spring design illustrated in this page represents an important departure from regular practice. It is the invention of the Perfection Spring Company, of Cleveland, Ohio, and so far as we know, is the only automobile spring which is delicately sensitive, and yet strong and firm at the same time. In other words, it is the only spring that uses just as much of its strength as is made necessary by variation of weight and road surface. This is brought about from the fact that the spring is made up of two mutually acting members, one the semi-elliptic member, approximately carrying the normal or unloaded weight of the wagon, and the other the scroll member, being brought into action just as much, and only as much, as the conditions of the moment require, thus being automatic in its adaptability to conditions.

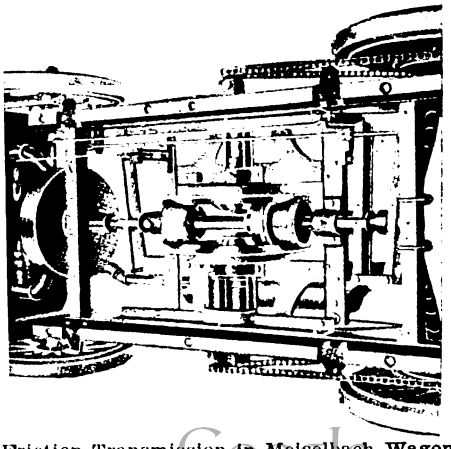
Various patterns of the Perfection spring are shown, that at the top of the illustration being the choice of the makers whenever the frame design of the vehicle makes its employment permissible. As an accommodation to other frame designs the scroll may be omitted from one or both ends of the spring.

Double Mitre Friction Drive

THE friction transmission used in the one and three-ton gasoline wagons made by the A. D. Meiselbach Motor Wagon Co., of North Milwaukee, Wis., has been demonstrated to advantage in many a difficult journey. The rough but gratifying experience of a Rockford, Ill., purchaser of one of the company's light wagons, who ventured to take the vehicle from the factory to his home under its own power, was recorded in a recent number of this paper and made such an impression upon some of our readers as to lead to a request for an extended description of its transmission.

Both light and heavy vehicles are fitted with the friction transmission. The crank shaft is continued well back to the rear axle, this continuation carrying three conical friction wheels made of tarred fibre, which are brought into contact with a pair of large-diameter mitre disks carried on cross shafts, from the ends of which shafts the two side chains connect the back wheels. Three friction wheels are needed on the continuation drive shaft, the forward one for the reverse speed, the back two for driving ahead, the larger one of the two for starting on slow speed, and the smaller one for driving direct. The disks are of a combined disk and cone design, with a 4½-inch face on the friction cone wheels, and as these cone wheels are thrust by means of ball trusses against the cones on the large disks the contact is made without a direct side thrust on the disks.

The low forward and reverse cones work on a sliding key on the drive shaft; the high speed cone wheel is held to the drive shafts by set screws, and when it is brought into use the entire shaft is moved forward, which is made possible by a sliding joint in the forward part of the shaft. The large mitre disks are of gray iron, made with as smooth a friction surface as possible, and each is carried on a short shaft of two-inch material, which shaft is



Friction Transmission in Meiselbach Wagon.

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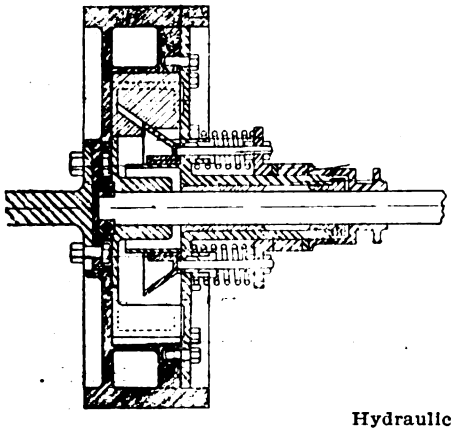
in turn carried in phosphor bronze bearings.

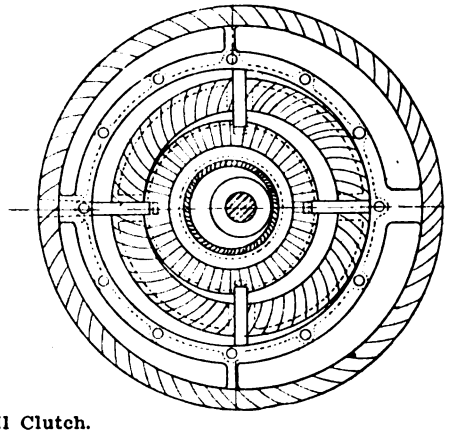
On the right side, the chain sprocket is carried on the end of the shaft carrying the disk, but on the left side the chain sprocket is on a short shaft paralleling the disk shaft and just ahead of it. This short shaft is driven from the disk shaft through bronze and steel gears always in mesh. The short shaft is essential to get the proper drive at the back wheels, the left disk revolving in a direction opposite to the right one at all times. The entire transmission parts are carried in a case attached to the underside of the main frame.

The one-ton wagon is fitted with a two-cylinder, 15-18 hp. engine. Its chassis weighs 2,700 pounds. The three-ton wagon weighs 3,700 pounds and is fitted with a 25-28 hp. engine of the same type. The speed of the light wagon is limited to 12 miles an hour, that of the heavy wagon being limited to 10 miles an hour. Both models are fitted with roller bearing axles, I-beam in front and square in the rear. The track of both is 60 inches. In the light wagon the wheel base may extend from 84 to 96 inches, in the heavy model from 96 to 108 inches.

HYDRAULIC OIL CLUTCH.—The clutch made by the North Chicago Machine Company, North Chicago, Ill., permits starting from standstill on the high gear and gradually advances the vehicle without jerks. It eliminates the use of speed transmission, except reverse, when engine power is sufficient. Flywheel and clutch are combined. The flywheel body is bolted to the crank shaft of the motor and is driven by it. The clutch head carries the main bearings of the driven shaft and is bolted solidly to the flywheel body. Each piston blade has a slot and is fitted to slide into a cone-shaped ring. An eccentric ring is cast with the clutch head. This carries an auxiliary ring to which is attached two studs. These studs pass through the stuffing box in the head of the clutch and are bolted to a sliding flange. The piston ring is keyed to the driven shaft. It has four or more slots cut at right angles to each other and into which the piston blades slide. The jaw ring is keyed to the end of the main bearings. Between this and the sliding flange are two wedged shaped rings. All the parts are fastened and revolve with the fly-wheel, except the driven shaft, piston ring, piston blades and cone ring. These parts revolve freely if there is no oil in the body of the flywheel. When the clutch is installed, taking the place of the flywheel, about one and one-half or two quarts of oil is poured into the oil space through a small opening in rim of flywheel body. When power is applied to the foot lever two wedge-shaped rings move in opposite directions and force the flange ring inwardly. This acts upon studs, auxiliary ring and cone ring. The cone ring in turn follows slot in piston blade and draws the same toward the center or until the blades are flush with the piston ring. Then, there being no obstruction to the oil, it will pass freely around the piston ring and follow the oil space with the flywheel. This free passage of the oil allows piston ring blade and shaft to remain stationary. When the foot lever is released the springs force the sliding flange outwardly. This causes a reverse action and pushes the blades toward the outer wall of the flywheel. As this confines the oil between the blades, the oil cannot pass them or between the wall of the piston ring and flywheel. The result of the confinement of the oil forces the blades and the piston ring to revolve with the flywheel. If you allow the sliding flange ring to move out slowly, the piston blades will move out gradually. This resistance to the free flow of the oil gives a gradual pull as you move out the blades, until you get the full power applied to the car, when the blades reach the outer wall of the flywheel. In other words, the gradual advance of the blades toward the outer wall of the flywheel is proportionate to the power transmitted through the clutch to the car. The speed of the car is in this manner governed entirely by the action of the clutch.

SPECIAL BUILT MOTOR BUS.—A company has been organized at Lake Pleasant, N. Y., to operate a motor stage line between that place and Northville, a distance of thirty miles. It has placed an order with the Autocar Equipment Co., of Buffalo, for a 16-passenger car to be built from designs to be furnished by Martin & Co., the New York automobile engineers. As the road conditions are very bad, surface poor, and hills long and steep, it has been decided to have a car especially constructed to withstand the severe treatment to which it will be subjected. The specifications call for a 40 hp. engine—three speed sliding gear transmission and side chain drive. Axles and steering gear will be made from nickel steel, hammer forged, and transmission from special chrome nickel.





Hydraulic Oil Clutch.

CHANGE OF SUPERINTENDENTS.—W. C. Guilder, formerly with the Pope-Toledo Co., has accepted the position of superintendent of the Commercial Motor Truck Co., of Plymouth, O., former Superintendent Avery having disposed of his interest in said company in order to look after his Chicago interests.

NEW SALES MANAGER.—Freeman L. Loomis became sales manager of the Reliance Motor Car Co., of Detroit, on March 1. He was for twenty years the most active field organizer of the Aultman & Taylor Machinery Co., at Mansfield, Ohio, and manager of its largest branch houses successively in Omaha and Minneapolis. Mr. Loomis is a man of wide acquaintance and sales experience, and a good organizer of sales forces. He was in charge of the company's exhibit at the Boston show.

ROGER MCMULLEN'S NEW ACCOUNTS.—Roger B. McMullen is handling the product of the Pennsylvania Rubber Co., of Jeannette, Pa., which has branch stores in 12 of the more important cities in the country and whose resident managers will represent all of the products which Mr. McMullen will sell to the automobile trade. Another account which Mr. McMullen has secured is that of the Hydraulic Pressed Steel Co., which concern makes pressed steel frames for automobiles.

KNOX PLANT ENLARGED.—Within recent months the capacity of the Knox Automobile Co., of Springfield, Mass., has been practically doubled. The last structural addition made to the plant consists of a four-story and basement building, nearly 200 feet long by 75 feet in width. The capacity of the factory is now four complete touring cars and one complete motor wagon each day.

WESTERN BRANCH.—The National Sales Corporation of New York, has opened a branch at 1436 Michigan avenue, Chicago. This move became more necessary owing to the increased line of automobile appliances now handled by that organization which consists of Connecticut coils and meters, Royal storage batteries, "Soot-Proof" spark plugs, Conover folding wind shields, Pengeot

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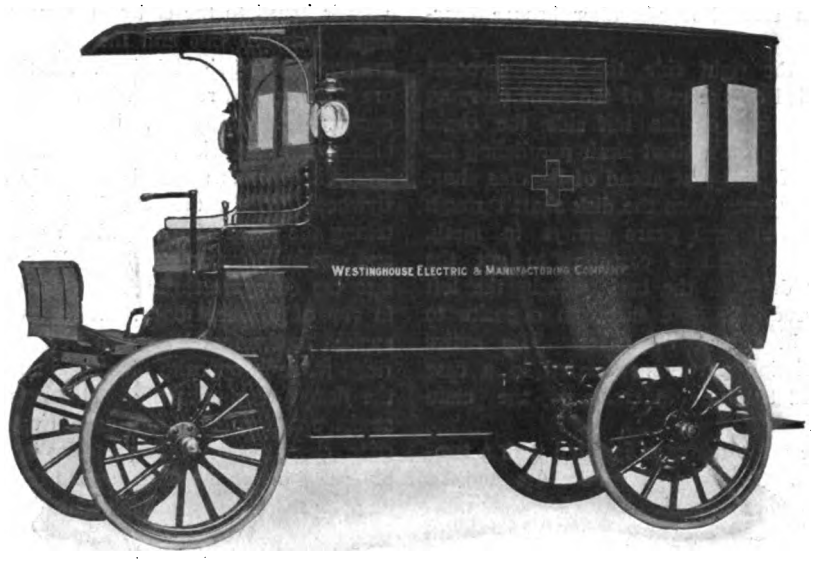
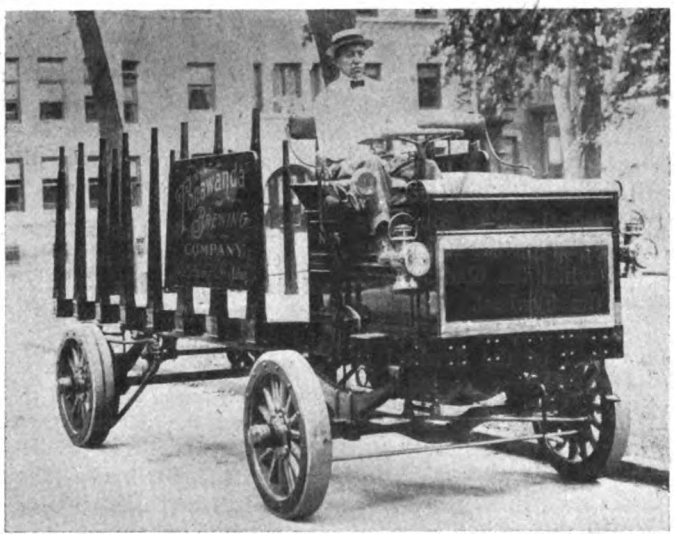
chains and rims, "P. D. Q." tire repair plugs, Hercules shock absorbers, Pirelli cable and Corcoran lamps. F. J. Alvin, who during the past six years was connected with the American Electric Novelty Mfg. Co., of New York, will have charge of the western branch. Mr. Alvin is favorably known throughout the country as having successfully introduced the "Ever Ready" dry batteries. In order to accommodate the trade in that section, a complete line of the above appliances will be carried in stock.



Studebaker Electric Ambulance.

FIVE-TON GASOLINE TRUCK.—The five-ton gasoline truck made by the Autocar Equipment Co., of Buffalo, is shown on this page. Its frame is made of seasoned oak or ash 7 inches wide and 3 inches thick, armored with steel. The wheel base is 120 inches long, the tread 70 inches long (62 inches if desired). The rear axle is of hand forged steel 3 inches square. The front axle, of I-beam pattern, is 3 inches deep and 2½ inches wide. The brakes are of the double acting internal expanding type. A foot operated brake is also fitted. The drive is by double chain from jack shaft to sprockets on rear wheels, sprockets being cast integral with brake drums. The motor, which develops 45-50 hp., is of the four-cylinder vertical variety.



Auto-Car Equipment Co.'s Five-Ton Gasoline Truck.

STUDEBAKER ELECTRIC AMBULANCE.—The motor ambulance made by the Studebaker Automobile Co., of South Bend, Ind., is fitted with two motors and four trays of battery, each containing 12 cells. It has a range of 40 miles and can be speeded to 15 miles an hour. Its wheel base is 92 inches. Steering is accomplished by means of side lever. The clear carrying space is as follows: Length, 7 feet; width, 38 to 42 inches; height 58 inches. Total weight of vehicle is 3,700 pounds. Ampere-draw on level, with load, is 30. Solid tires, measuring 36 x 3 inches are fitted. The extreme length of the vehicle is 11 feet 2 inches.

SAYERS & SCOVILLE'S NEW PLANT.—A motor wagon factory adjoining their present carriage plant will be built this spring by Sayers & Scoville, carriage and buggy manufacturers, of Cincinnati. The new plant will be five or six stories in size and will be purely for the construction of the heavier motor trucks. The building will be constructed of brick and cement.

BAGGAGE TRUCK FOR GLIDDEN TOUR.—The Reliance two-ton gasoline truck has been selected by the American Automobile Association as the official baggage truck for the Glidden tour this year.

ANOTHER WAGON FOR CHICAGO'S LIBRARY.—The use of motor delivery wagons has proved so satisfactory to Supt. Purer of the Chicago Public Library that the institution has just purchased its fifth vehicle. Nothing but horse-drawn wagons were used by the library up to three years ago, when a 16-hp. Knox wagon was purchased. It soon showed that it was faster, more reliable and more economical than the horse-drawn vehicles. Consequently the number of motor wagons in use has increased constantly.

A VALUABLE ORDER.—The Boston agent of the Logan Construction Company recently secured an order from the West Barnstable Motor Company for fourteen Logan commercial vehicles, valued at $24,000, to be delivered before May 25. The order specifies delivery of trucks, sight seeing cars and wagons which will be used in transportation between West Barnstable and Osterville, Wianno, Marston Mills, Cotuit and Centreville.

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WALTER WARDROP, EDITOR

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Agricultural Trucking

Amazing Waste of Money Caused by Using Horses for Primary Haulage

UPON ascertaining the present cost of hauling farm products to shipping points it becomes evident that the motor truck must eventually supersede draft animals in such work. The cost of primary agricultural haulage is now so extravagantly high as to cause amazement among those who know how cheaply this class of transportation could be performed by motor wagons.

Taking twenty-three kinds of agricultural products, from apples to wool, the average cost of the team haul is found to be 11 cents per hundred pounds, and the average cost per ton mile 23 cents. There are many records to show that farm products can be moved by motor vehicle at one-fourth of the cost just mentioned.

* * *

The primary haul of agricultural products averages no more than between 8 and 10 miles, which fact makes even more striking the high percentage cost. This suggests that an analysis of the distribution of charges between the producer and consumer would be of profound and startling interest. Nothing would more plainly indicate the artificial nature of our commercial operations, and the enormous proportion of gain which falls to the lot of the intermediaries. The middleman has a legitimate function as a distributor, but most things are levied upon by a long series of aggressive beneficiaries who get most of the gain en route. The transportation problem is serious in every large country and the charges are necessarily somewhat heavy, yet through the growth of a purely artificial system these charges have become a prodigious element of cost, to an extent oftentimes absolutely needless in the general economy of productions, and representing little better than plain loot secured by improper monopolies. We are not here concerned with these larger matters, however, so much as with the losses that are incurred in primary transportation—that from the point of production to the consumer or to the first necessary intermediary.

* * *

The motor truck seems the only agent which promises relief. Its superior speed and carrying capacity, its economy in operation and its demonstrated ability to perform useful work wherever highways are suitably maintained, are points in its favor which concern every economist. If there are no roads worthy of the name they can be constructed so as to make agricultural primary haulage much cheaper than it is at present. The longer the haul the more economical the motor service. The distance over which it will pay to haul a given crop practically limits the production of that crop. Beyond that limit a more valuable product must be grown. Cotton is hauled a greater distance than wheat; wool is hauled on an average twice as far as wheat and more than three times as far as cotton. The average haul of wheat to shipping points is 9.4 miles; the average weight 3323 pounds; the cost of this haulage to the farmer is $2.86 per load and its cost per ton mile is 19 cents. The average haul for corn from farm to shipping point is 7.4 miles; the average load is 2696 pounds; the cost per load to the farmer is $1.78, and the cost per ton mile is 19 cents. The average haul for cotton is 11.8 miles; the average load is 1702 pounds; the cost to the farmer is $2.76 per load; the cost per ton mile is 27 cents. It will be observed that horse haulage rises as the distance increases, whereas in the case of motor haulage it would decrease as the distance increases.

* * *

As there are few individual farmers who could afford to own trucks, co-operative ownership would seem to be demanded if maximum economy of the machines is

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to be obtained. It will be recalled by readers of this paper that well studied efforts to ascertain the advantages of co-operative agricultural motor haulage were recently put forth in England, resulting in demonstrations that amply justified the wide application of the experiment. The farmer is not so dull that he does not perceive the importance of an instrument which has for one of its chief functions the lengthening of the economic radius of primary haulage. With an available speed of 8 or 10 miles an hour the motor truck might easily double the length of the first haul. And thus around a city, for example, more than four times the present territory would become available for market farming, which is the most profitable agriculture when the long list of greedy intermediaries is reduced to a reasonable extent.

* * *

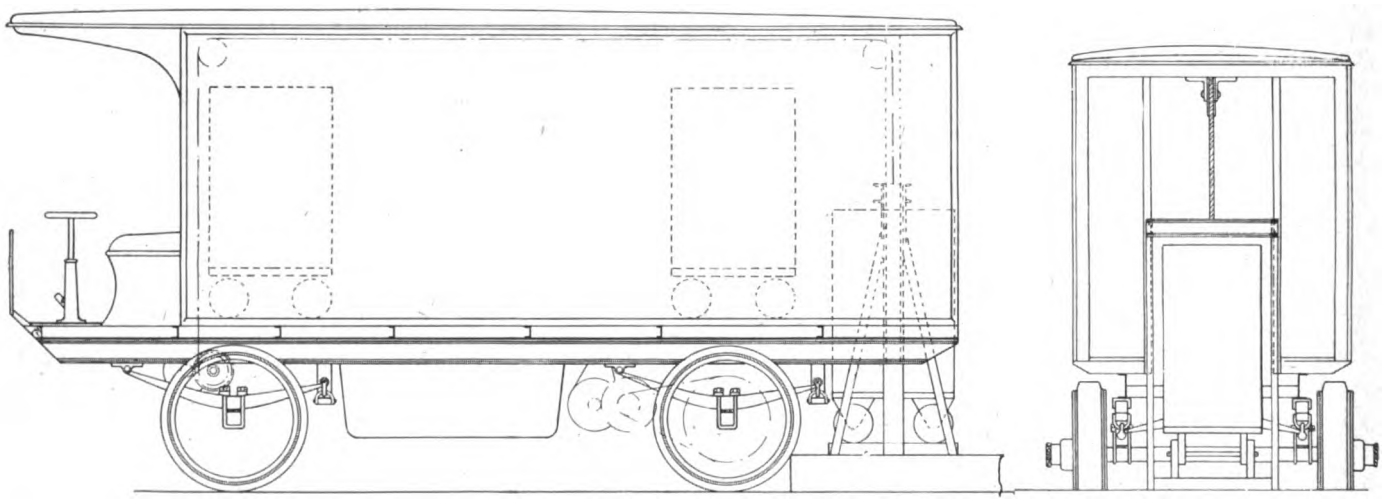
The motor truck, with its space covering advantages, would amply justify its use in simplifying the distribution of farm products even if it could do nothing in reducing haulage costs. In fact, however, it seems well fitted to do both, and thus possesses a double usefulness. In view of these possibilities, the improvement of roads becomes almost a matter of self preservation in rural communities, and future main thoroughfares all over the country should be built with the needs of the motor truck in view. If good for it they will be good for all purposes.

* * *

To further illustrate the amazingly high cost of primary haulage of agricultural products we present statistics which have been obtained from the Department of Agriculture. The highest cost is for wool, which is carried on an average of 39.8 miles from farm or ranch to shipping point at a cost of 44 cents per hundred pounds for the entire distance. The lowest cost for any one product is for hemp, which is hauled from farms to shipping points at an average cost of 6 cents per hundred pounds, the average haul being 5.2 miles and the average load weighing 3393 pounds. Oats and barley cost 7 cents per hundred pounds for primary haulage; hay, flaxseed, rye and timothy, 8 cents per hundred pounds; potatoes and beans, 9 cents; tobacco and live hogs, 10 cents; rice, hops and buckwheat, 11 cents; apples and peanuts, 12 cents; vegetables (other than potatoes) and cotton seed, 15 cents; and fruit (other than apples) 16 cents per hundred pounds.

* * *

The great waste attending primary haulage of agricultural products cannot be calculated from these figures alone. Other factors are needed in order to make the picture complete. It is estimated that nearly 50,000,000 tons of agricultural products were hauled from farms to shipping points or destination last year at a cost of about $85,000,000, or more than 5 per cent of their value at local markets. Of this traffic 40,000,000 tons represent the weight of corn, wheat and cotton, the cost of hauling these three products alone being close to $70,000,000. Conservatively calculating the motor wagon to be 50 per cent more economical than horses in hauling agricultural products, we are confronted with the fact that there is here annually a waste of $43,000,000.



U. S. Treasury Wagon

SOME time ago William P. Kennedy, consulting engineer for the McCrea Motor Truck Company, of Cleveland, designed the truck shown above for the Treasury Department at Washington to take the place of the three-horse wagon which for years has been hauling paper money from the Bureau of Engraving to the Treasury. The money is placed in iron safes, each weighing about 1500 pounds. The motor truck was designed to carry three of these safes. As at the Treasury it is necessary to lower safes to the level of the sidewalk, a small elevator, operated by individual motor under the driver's seat, was located in the rear of the truck body. The safes thus can be easily raised or lowered from the truck to the sidewalk. The body of the truck is lined throughout with steel, and a set of folding doors immediately in front of the elevator makes the truck body burglar proof. The extreme rear end of the body, in which the elevator is placed, is equipped with a folding seat on each side to accommodate four guards. The truck is equipped with two motors and a 42 cell battery, has a minimum radius of 25 miles and a speed of 6 to 8 miles per hour.

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Motor Cabs For New York

Three Hundred Gasoline Vehicles Purchased Abroad—W. K. Vanderbilt, Jr., Interested

POWERFUL financial interests are pledged to support the Motor Carriage Company, a New York organization with a capital stock of $1,000,000 which proposes to operate 300 gasoline cabs in that city within the period of a year if deliveries from the French factories from which the machines will issue can be obtained as rapidly as the company anticipates. The president of the company, G. Winthrop Sands, sailed for France about the middle of last month for the purpose of closing negotiations which have been under way for several months with two French companies which specialize the manufacture of gasoline cabs. It is expected that he will arrange for the delivery of twenty-five vehicles in August and twenty-five more each month thereafter until the whole order is completed.

* * *

W. K. Vanderbilt, Jr., is said to be a large stockholder in the operating company. As he is known to be enthusiastic on the subject of motor cab use, and is already heavily interested in the New York Cab Company which operates horse-drawn vehicles, it is suspected that the time is not far distant when a merger of these two interests will take place. The management of the company will be entrusted to Walter Allen, Harry Allen and Charles Raoul-Duval, who are now connected with the De Dietrich motor company of New York. Walter Allen is secretary and treasurer of the Motor Carriage Company.

* * *

The cabs selected for purchase are the Unic and the Chenard, the latter an unknown quantity in this country, fitted with 16-20 hp. engine. The Unic can be bought in large lots at $1275 abroad, exclusive of tires. The cost will be doubled after the import duty charges are paid. Eventually chassis only will be imported. The Unic is made in the Georges Richard factory, the Chenard in the works of Chenard & Walcker. Both will probably be fitted with pneumatic tires at the commencement of the service. This much is inferred from the fact that the Unic cab is so equipped in London and other cities where it is employed. The experience of London motor cab companies with pneumatic tires, however, has not been uniform. Starting with the pneumatics, the London Motor Cab Company's vehicles are now almost entirely equipped with solids. The Automobile Cab Company is also a convert to solids after trying pneumatics. The City and Suburban Motor Cab Company, on the other hand, will employ nothing but pneumatics. It is gossiped that the reason another company discarded pneumatics was because the maker's guarantee to maintain them at $225 per annum per vehicle was not remunerative.

* * *

Again the question arises: why is it necessary to go abroad for motor vehicles for public service when it is highly probable that before full deliveries can be made American manufacturers will be freely producing machines in all respects as good as any which may be imported at twice the cost? Advancing the operations of the Motor Carriage Company for one year, and calculating upon the success of the enterprise, it is certain that more than 300 cabs will be needed and if they are not forthcoming immediately from the French factories opportunity will be given for competitors to introduce a motor cab service based upon American manufacture.

To operate 300 French cabs in New York City will entail an enormous expense which could be obviated if American cabs were purchased. Spare parts must be carried in large quantities, and to get the most effective service the workmen who make repairs must be familiar with the factory construction. It is not improbable that in order to achieve the best results the Motor Carriage Company will find it necessary to import many of its shop operatives as well as its cabs.

* * *

Obviously, then, the Motor Carriage Company starts with a heavy handicap. It is paying twice as much for its rolling stock, owing to the tariff charges upon automobile importations, as would be necessary if the machines were made in this country. It is operating a long distance from the seat of manufacture and must inevitably experience the same delay in obtaining needed materials which English motor bus companies encounter when parts for replacement are required for the French built machines they own. Further than this, the natural desire of all manufacturers is to supply native demand before attention is given to foreign custom, and while at this moment French motor cab builders are eager to pick up orders in every quarter of the world it is very unlikely that a couple of years from date, when their home industry is still further developed, they will be so solicitous of faraway trade as they are at this moment. The experience of all who were tempted to invest money in the sale of foreign made bicycles at a time when the American makers could not keep pace with the native demand proved how unreliable a trade could be which was so insecurely founded.

* * *

Anyone who mixes with American automobile makers well understands why they do not cultivate export trade relations. The temptation to do so is always present—in fact the product of every factory in the country could doubtless be sold with ease in foreign countries, but such a course of policy would not develop the native industry, and after all it is out of domestic patronage they must live. The truth is, no nation manufacturing automobiles of whatsoever kind is in position to solicit foreign trade upon a permanent basis. Material is scarce, manufacture is slow owing to the shortage of machinery, and these are conditions which are not likely to be relieved for some years to come. Added to this, foreign trade as between nations which are ranked as producers is a variable quantity, low when native demand is strong and high when it is weak. At any time within the past three years American makers of automo-

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bile parts could have kept their factories busy with orders from abroad. They will seek foreign markets when the home trade is insufficient to absorb their productive capacity.

* * *

Every well informed person is familiar with the tricks to which foreign manufacturers resort in order to evade the obligations of contract for promised delivery, and it is not likely that the Motor Carriage Company will obtain any better treatment than other buyers of French automobile products. The urgency of the situation may in a measure account for the placing of an order for 300 gasoline cabs abroad. To stand off competition is important, but it is not everything. Haste to forestall competition does not create a monopoly. All other things being equal, a motor cab company using American machines could one year from date easily compete with the Motor Carriage Company's foreign made machines and at the end of a given period of years show greater gains. It is not likely that the Motor Carriage Company can buy its vehicles at much less than $1,500 apiece. By the time they are landed in New York they will have cost $3,000 apiece. Thus there is sunk in duty charges the sum of $450,000 on the first order. This amount must be earned in service and it represents the commercial advantage which a company using American machines would at the outset have over the one now under consideration.

* * *

Because American manufacturers have not solicited orders for gasoline motor cabs it is not to be taken as implying that they do not desire to build such vehicles. The chances are that if a bona fide order for 300 gasoline cabs were offered to any concern in the country, and a year allowed for their delivery, ways and means would be found for constructing them in spite of the fact that all factories are badly congested by regular production. The same congestion, however, which exists in this country exists abroad. Some of the French companies making motor cabs as a side line are known to have booked orders which will keep them busy for two years to come, and yet they are still writing new business and promising one year's delivery. The same situation existed when the motor bus industry was being developed in London. It was calculated a year ago that there would be fully 2,000 of these big vehicles in service in the world's metropolis by this time. It is doubtful if there will be so many one year from date, seeing that the number has not yet risen higher than 950. Large cash deposits bind the buyers to the makers, many of whom have their factories in France.

* * *

Business necessity, or its counterfeit, often drives people in directions whither they have no inclination to go. Such appears to be the case with the buyers of motor cabs here and in other parts of the world. They are purchasing in a market where the sellers profess to be able to make prompt delivery, but which in reality is as badly congested as the American market. There are many disappointments in store for those who buy abroad before they can be brought to realize that their natural market is here at home. The London motor bus companies, which begun by buying machines in France, Germany, and wherever else they could obtain them, are today settling down to the purchase of home products and bitterly regretting the ill advised haste with which they commenced operations. They have this consolation, however, though they were far from the seat of manufacture they were not compelled to pay twice as much for their vehicles as they were worth.

MILWAUKEE'S MOTOR MAIL WAGONS

RECENT issues of this paper have contained many particulars of the steam wagons used in the Milwaukee postal service, but little has been heard concerning their behavior in action. The postmaster at that point clears up all doubt concerning their usefulness by saying:

The service has been in vogue long enough to fully demonstrate its adaptability to large cities, or small cities where the roads and streets are particularly good. The only difficulty we have experienced has been in going into new districts where the streets were not paved or macadamized—the weight of the car is too great to go over soft streets, especially in the spring of the year.

Since inaugurating this service our entire collections have been revised, and each autocar is collecting practically what three horse collectors did previously. The next important improvement must be in the mail boxes. At present I am endeavoring to have the department supply me with a drop bottom box. Such a box would enable us to empty boxes on an average of 10 seconds to a box, regardless of the amount of mail therein—the 10 seconds being the period from time car stops until it is in motion again. With first-class men handling the cars there can be no question but what automobiles can collect mail in large cities cheaper and to better advantage than collectors with horses can do.

The above relates entirely to collection service. On July 1 we enter into another and additional contract, providing for the delivery of mail between our main office and stations. Cars to be used will be similar in design to thoses now in service, except that the skylight on the roof will be done away with, as there will be no occasion for a man standing erect in these cars.

We figure that we will be able to save on an average of 20 minutes in dispatching each mail to our stations, besides giving several additional deliveries over the old screen-wagon service. The average weight of mail is not large enough to overtax the capacity of the machine.

The most essential things to make this service a success are good roads and an intelligent chauffeur.

Los Angeles capitalists have formed a $200,000 company to operate motor buses between Camp Five, the southern terminus, and Sherwood, the northern terminus of the California Northwestern Railroad. At present the connection between these places is by means of old stage coaches.

Mail boxes have been installed on the outside of London motor buses from which letters are collected at regular intervals.

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Careless Drivers

Operating Wagons in Street Car Tracks Often Leads to Serious Interruption of Service

ALMOST everybody who professes interest in the operation of motor wagons has had occasion at one time or another to note the extreme carelessness of drivers of a certain class while steering their vehicles to destination. The employers of such men, however, are not always aware of the follies which they commit, although it is impossible to suppose that they do not suspect them.

Driving in street car tracks is a habit with ignorant and careless operators, acquired no doubt while handling the lines of a horse team for which the utilization of the smooth rails is almost a necessity if the tractive effort of the animals is to be eased. No such excuse, however, can be offered in justification for driving motor wagons in the tracks of a street car, as it is at all times adequately powered. So far from being a help in the matter of expediting the journey, the use of the rails is very likely to prove a menace to its successful accomplishment, particularly if, as in winter weather, the tracks are slimy or, as is not infrequently the case, they do not accommodate the vehicle wheel gauge and so act like knife blades upon solid tires.

* * *

During the last automobile show in Chicago some trade visitors were amused to see the driver of an electric wagon trail a street car in its tracks. Every thing went well for a few blocks, the driver of the wagon being sufficiently back of the car to arrest its progress by application of the brakes whenever the passenger vehicle stopped at crossings. Encouraged by the smiles of his audience, the driver became emboldened and approached too close to the end of the street car, which unfortunately was compelled to stop in the middle of the block owing to the traffic which impeded its passage. A hasty application of the brakes of motor wagon locked the rear wheels, but permitted the vehicle to slide along the rails. The result was a collision in which the dash of the wagon was wrecked, the valuable power recording instruments sharing the fate of the wood work. Curious to know what the negligent driver would say to his employers a couple of spectators of the accident stepped into the drug store while he telephoned news of the misfortune, and to their astonishment heard him declare that his wagon had been run into at a street intersection by an unmanageable horse-drawn team.

* * *

There must have been many such accidents during the past winter. To guard against them, employers should have recourse to extreme severity, making it cause for immediate discharge if a driver uses street car rails for any purpose except to overtake traffic which is moving in the direction in which his own vehicle is proceeding. The loss arising from damage to the vehicle, in the event of a collision, may not always be as great as in the case mentioned, but the interruption to the service in which it is employed may be many times more costly than the repair of the actual harm done.

As owners of motor wagons realize the large measure of responsibility which is delegated to their drivers they will find that they will not be out of pocket by occasionally deputing some competent person to observe how the machines are handled while in action. Stable care is of the highest importance, but road carelessness may make more work in the stable than will look well in the expense account.

* * *

This suggestion will not be resented by those who know the difficulties which large employers of horse-drawn wagons experience in the education of their drivers. While it is commonly supposed that the driving of draft animals is an art thoroughly mastered by the majority of teamsters, it actually is the unhappy fact that there is as much ignorance concerning the care of horses and wagons as if the world had just discovered the commercial uses of both. The education of the teamster is a matter which always excites the liveliest interest of team owners. They well realize that a horse has so many ton miles capacity in him, and that the brute's energy is husbanded or wasted according as the man who drives him is careful or careless of the property in his charge.

We have heard so much about the evolution of teamsters to proficiency as motor wagon drivers that it is to be hoped when the conversion takes place the vices of which they are openly accused by their present employers will not be transmitted as a heritage to their new sphere of activity. Many as are the opportunities for abusing the horse, they are few as compared with the opportunities for abusing the motor wagon, and, what is much more to the point, the abuse of the former is not nearly so costly as abuse of the latter.

* * *

Perhaps the surest way to encourage careful driving of motor wagons would be to offer a bonus or premium for maximum vehicle mileage with minimum repair charges. The economy to be derived from the employment of motor wagons so largely depends upon the prudence of drivers that owners have strong reasons for keeping the skill of their men high at all times. Nor are owners the only ones with a strong interest in the driver's skill. Wagon makers are vitally interested in his development, or should be if they are not, since upon the economical road performance of one machine very often hangs the chance of obtaining repeat orders. Manufacturers, therefore, should by all means at their command fortify themselves with establishments to which they have succeeded in making a sale.

This thought evidently suggested itself to the British concern which offers a prize of $25 to all motor wagon drivers who show really economic records after operating 5,000 miles. As a result of this gentle stimulation, the firm in question had the satisfaction of ascertaining that one of its two-ton vehicles, after traveling 5,054 miles in the service of a drygoods merchant, was only charged with $289.60 for fuel, lubricant, tire and other repairs.

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Unreasoning Prejudice

Cleveland's Fire Department Chief Does Not Favor Motor Driven Apparatus

AN opinion not founded upon reason or experience is untrustworthy. Ergo, when a fire department chief who never had occasion to observe modern motor fire vehicles either in or out of action, and hence must guess at or imagine their value, pronounces against their employment, we may safely challenge his fitness to be custodian of lives and property. For either he is ignorant of matters with which he should be professionably familiar, or else his prejudice is more marked than his reason.

* * *

Cleveland's fire chief says motor fire apparatus is not needed because forsooth it is too heavy. But he does not inform us by what standard he judges weight. Probably the citizens whose lives and property are under his protection would not object to paying for heavier vehicles if they were demonstrated more efficient that those now in use. But the chief robs them of this small comfort by remarking that the utility of motor driven fire apparatus is problematical. Many of the things about which we are not well informed are problematical, even enigmatical. Ignorant people always invent terms and phrases to conceal their stupidity.

As a crowning bit of folly the chief professes to believe that motor driven fire apparatus has little advantage in the matter of speed over horse-drawn apparatus. It is the testimony of every fire insurance expert that a few seconds saved in reaching the scene of a conflagration is of inestimable value. Fire prevention, not fire extinguishment, is the main purpose of a fire department. Trifling gains in speed, therefore, are not to be despised. The speed of the motor fire vehicle may not be so great as the rich fancy of Cleveland's fire chief could wish, but there is plenty more where it comes from. The supply is inexhaustible.

* * *

The time has arrived for the fire chief of every big city to be something more than a picturesque hero who is content to live up to the traditions of a lethargic past. Science and invention, having helped to develop the efficiency of the work accomplished by his department, may now reasonably claim much of his attention. He should no longer be a husky blockhead with an eye for a gaily painted running gear or a choice piece of horseflesh, but a thoughtful administrator who understands the application of various mechanical powers to road transport and is competent to oversee a branch of public service in a manner fully befitting its importance.

* * *

It is a sign of the forward condition of the motor fire vehicle in this country that a week seldom passes without some influential organ of public opinion editorially calling attention to the advantages to be gained through its employment. Public money could not be better laid out than in the purchase of such insurance as motor engines, motor hose wagons, motor escapes, motor stand pipes and motor hook and ladder wagons afford. It is ridiculous to chatter about the weight of fire apparatus when by addition to it, its efficiency is enormously increased. Vienna has the best fire department in the world, the most economical, the most effective, the best disciplined. It has proudly boasted of this for years. Three years ago it decided to get along without horses. Today its fire service is wholly motorized and more economical and efficient than ever. In a hundred other European, British and antipodean cities the motor fire vehicle is conspicuously, usefully and profitably at work. Yet Cleveland's chief, who, were he so inclined, might easily procure the verified records of all these installations and become convinced that there is nothing problematical about their value, opposes his stupid prejudice against the mass of favoring opinion which they represent. In the following article from the *Plain Dealer* he is too gently dealt with, his ignorance being concealed while his judgment is softly impeached:

> In discussing methods for bettering the Cleveland fire department surprisingly little has been said of the self-propelled fire engine. In other cities these engines have been tried, and the results have not been disappointing. In Cleveland Chief Wallace is not in favor of making any change, while President Excell of the board of public safety believes that an experiment, at least, could do no harm. Mr. Excell points out that in many cities the results have been satisfactory. Chief Wallace, on the other hand, claims that automobile engines are too heavy and cumbrous, that their effectiveness is problematical, and that not much gain in speed is to be made in city streets.
>
> Last week a large fire occurred in the extreme south end of the city, and a third alarm was sounded. This brought engine companies from a distance of several miles. Their services were not needed, but for half an hour after the fire was out the engines continued to arrive, horses panting and almost ready to drop from exhaustion. The suffering of the horses, and the great length of time required for the engines to reach the scene of the conflagration seemed to be arguments in favor of a horseless fire department. At any rate an experiment would be instructive.

MUNICIPAL SPRINKLING WAGON

CONSIDERING the all around economy of the motor sprinkling wagon, several kinds of which have been shown in this paper, it is surprising that municipalities have not long since adopted it as a regular feature of street department apparatus. There are two motor sprinkling carts in this country, several in Great Britain, and a few in European cities.

The most modern type of sprinkling wagon has just been supplied to Berlin. It spreads water over a road space 65 feet in width, which is almost three times the area covered by the ordinary horse-drawn water cart. This permits sprinkling of the street at one passage of the wagon, and as the vehicle has much greater speed than a horse-drawn watering cart a larger economy is expected of it. The tank carries 5 tons of water and is divided into three compartments.

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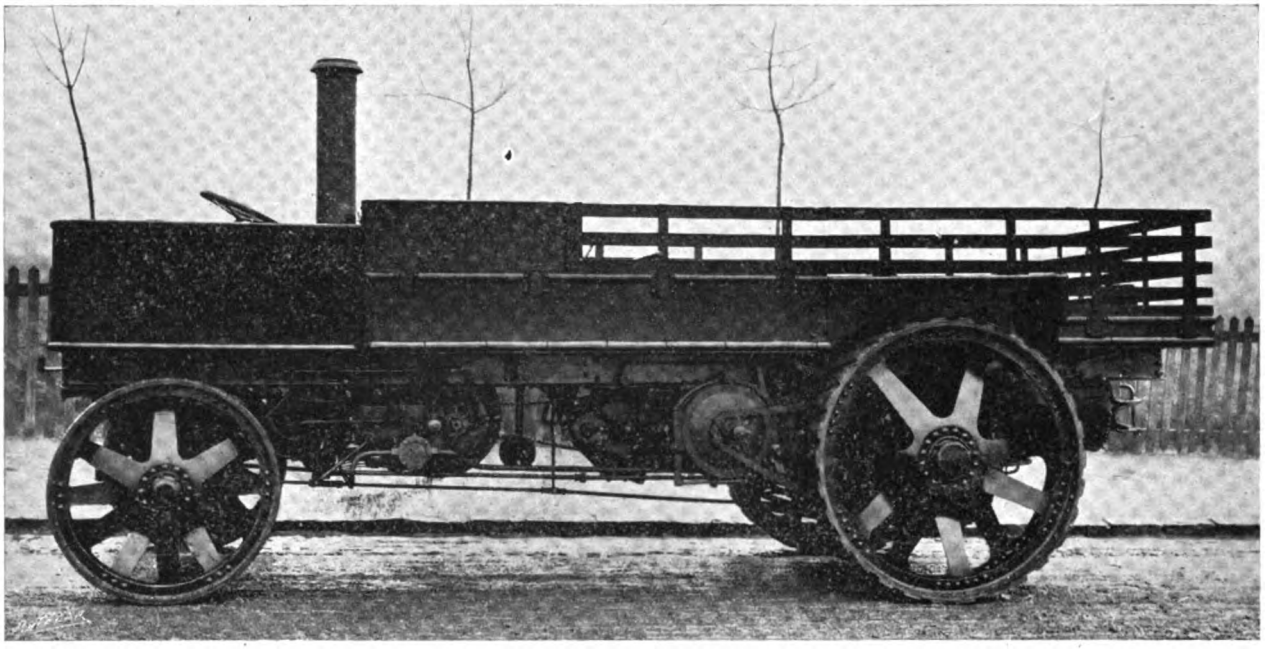

Gasoline Military Wagon; Stack is for Carrying Exhaust High Up in the Air.

Military Motor Vehicles

Their Efficiency in Mobilizing Troops, Transport and Artillery Work is Highly Valued

IN reflecting upon the advantages of motor road vehicles in military service it is at once perceived that the economy their employment would afford in times of peace is almost as important as their usefulness in actual warfare. Armies are not always engaged in fighting. When not on a war footing it is just as necessary that they be economically maintained as that any other branch of government be administered without waste.

The most competent authorities admit the value of the motor wagon in military transport, recognizing that its employment in such work would reduce operating expenses, improve the service, and materially lessen the number of non-combatants. The ideal army would be one composed of the fewest and most efficient non-militant units. The efficiency of the transport department is an indication of an army's field strength. If it is weak, slow and cumbrous the troops are hindered in their movements, while if it is highly organized their movements are facilitated.

In the mobilization of troops the motor road vehicle might be expected to play a very important role. Why not rely upon the railroads in such an emergency, someone may inquire. The railroads are already overtaxed with the commerce of the country and upon critical military occasions are notoriously inadequate. Even if their efficiency were raised it is doubtful if they would prove superior to motor vehicles in concentrating troops for national defense at points most likely to be threatened by an enemy. In a recent issue of this paper it was shown what measures have been taken in England to utilize motor road vehicles as auxiliaries in times of national peril, buses, wagons and tractors being subject to hire or purchase by the war authorities. That country is ribboned with railways, and yet its military guardians have no great faith in their usefulness at times when it might be necessary to rapidly concentrate forces for purposes of defense. The elaborate adjustment of commercial rail traffic, its inflexibility, the congestion which would arise for overtaxation of it, the many delays incident to entraining and detraining, are matters which keep military strategists in a state of chronic uneasiness. For these and other reasons the opinion is prevalent in army circles abroad that by employing motor road vehicles infantry, and all requisites for their maintenance, could be concentrated at a distance not exceeding 200 miles with more rapidity and ease than by means of railroad trains. This would leave the railroads free to transport the cavalry, artillery and bulky stores of war, and cause as little interruption as possible to commercial traffic. Many eminent English strategists have advocated such a course of procedure in the event that quick mobilization of troops became necessary.

In the course of a paper dealing with the usefulness of motor road vehicles in national defense, Sir J. H. Macdonald, colonel of the British army motor reserve, undertook to demonstrate that the railways are not the most dependable or the best means for transporting troops for distances not exceeding 200 miles. He said:

My main proposition is that there has been presented to us by the development of the motor road vehicle means for giving efficiency to national defense on land such as we never possessed before, means which if organized during peace for application in time of war, will give increased value to every power on land that we possess, and that in a degree so great that it can scarcely be over-estimated. There can be no doubt that in the case of an invading force endeavoring to effect a landing speed and ease of bringing troops to selected places for defense might make a small force more effective than a much larger number if the time necessary for bringing the latter forward was greater. Now, as

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regards national defense, the great point in favor of the road is that the country being narrow any defense forces which might be available in central parts of the area could, given a good preparatory organization, be moved by a great number of roads to any point or points on the coast on very short notice.

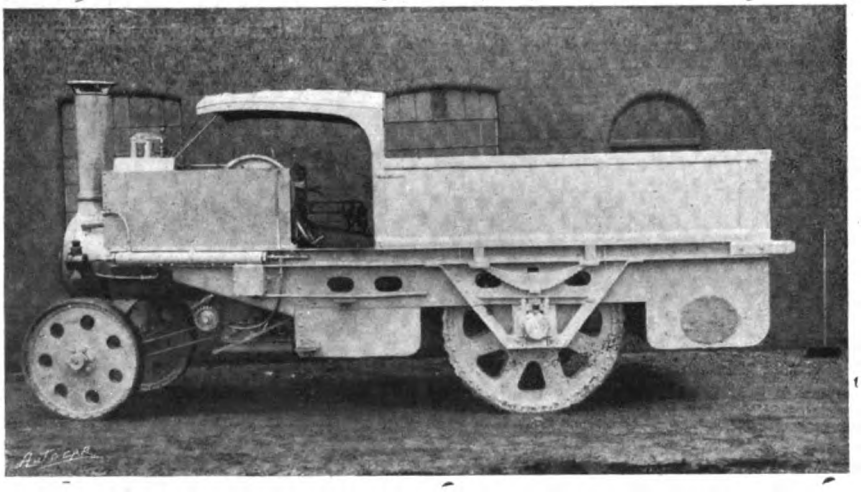
I state with confidence that many thousands of motor vehicles could be dispatched by road from any district in any direction and be half way to their destination before they could be concentrated at railway stations, the necessary rolling stock and locomotive power organized and brought into position, the forces entrained, and the adjustment of traffic made to enable the requisitioned trains to use the lines with anything like real dispatch.

We have now nearly 1,000 motor buses in London. By the end of the year we shall have at least 2,000. Assume that only 1,500 would be available for military use, and putting the load of each at 30 men, then these vehicles, running at an average rate of 12 miles an hour, could in six journeys convey 270,000 men 180 miles in 30 hours. This is a fair and unimpeachable illustration of the vast resource we now possess for rapid road movement of troops on emergency. Double the distance and the journeys and the troops moved would be halved. Nearly 45,000 men could by this method be conveyed 180 miles if necessary in one day by the 1,500 omnibuses. Of course, forces conveyed by fast-going autocars could do double the distance at least that the omnibuses could accomplish. There would be in London and the neighborhood at least 10,000 such vehicles, which at a low estimate, could carry 40,000 men. I give the number at 10,000 in order to keep well within the mark, begging only that it will be remembered that the number is being augmented by hundreds every month.

Road transport for goods by mechanical power is also rapidly increasing. I may mention that already such a firm as Pickford's have power haulage equal to 480 tons load; that many other firms are rapidly superseding horse power for conveying goods, one great firm being in course of substituting 300 power-driven vans for horse-hauled vehicles. These are indications of how the wind is blowing. And, be it remembered, that such goods wagons could on emergency carry large numbers of men as well as material. Can anyone doubt, in face of these facts, that if it is possible to utilize promptly and efficiently the power vehicles we possess, in the event of a national emergency arising, the advent of the motor road vehicle has added enormously to our defensive power?

Gasoline Tractor Built for British War Office.

But the value of this mode of utilizing the road is not to be measured merely by the general convenience for free and fast transit which it presents. It is obvious that even if other things are only equal, the efficient road vehicle has another very great advantage over rail transit. A railway line approaching a coast has only one head. It necessarily, if it be a line coming from a central place, has one terminus at the coast. When troops are brought up by it they have still to be distributed over the line of coast which it may be necessary to guard against the



Military Steam Lorry.

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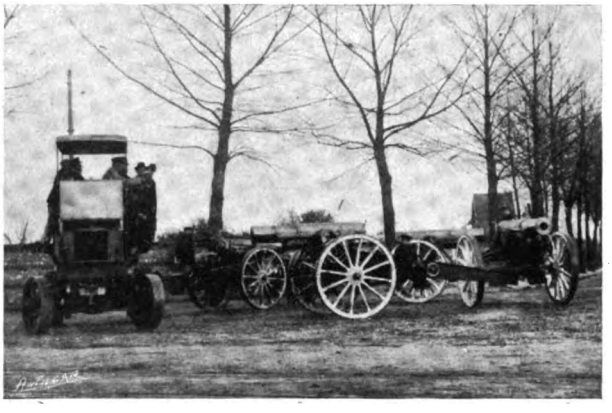
attempt of an expeditionary force endeavoring to effect a landing or landings. Therefore, if the troops are brought by rail they must be distributed either by coast lines or by road marches, or by both, to the points at which the strategist conducting the defense desires to post them, and thus will necessarily take longer time in reaching the place where they are required. Whereas, if troops are being brought forward by road they can be distributed from intermediate places direct by road to their different stations. For example, if the Yorkshire coast was threatened, and a force of 20,000 or 30,000 men drawn to Manchester from the west, and was moved on with orders to report at Leeds, the commander of the forces, learning of the dispatch by telegraph, could, by telegraph to Leeds, order the whole or part to proceed from Leeds in the direction of Hull, or the whole or part in the direction of Scarborough, through York, or the whole or part on Whitby, being always able to keep in touch with them by telegraph or motor cycle, as they passed through towns and villages, so as to have them thoroughly in hand for any change of disposition, either of direction or diversion in different directions, that might be necessary in consequence of the enemy's movements. For example, he could change their direction by telegraph at Hull and send a column northwards to Stockton and Middlesbrough, whereas he could have no such freedom in dealing with the troops if once they were in trains moving on a fixed railway line. When the troops are once entrained they are committed to such routes only as are laid with rails. There is no choice of roads, no possibility of freely changing direction. Flexibility in movement is impossible.

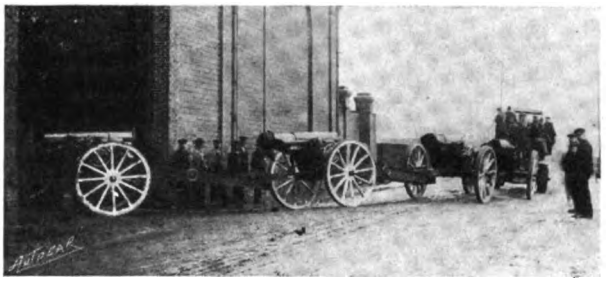
The troops are, as it were, locked up in boxes, dispatched under a time table, and the Chief Command must wait until they are liberated before he can deal effectively in directing their detail movements. On the other hand, when he has them on roads he can convey effective orders to them at any time by dispatch sent to intercept them, or by use of the telegraph to communicate with the commander or the staff officer going with the troops, and the change of direction can be effected without loss of a minute of time. In short, he would have as much freedom in dealing with them as he would have if they were on foot march at 2½ to 3 miles an hour, with the advantage that he could calculate that they were making their way in the general direction of advance at a speed equal to five times that possible by marching, and without limit as to distance, and that they were able to move at the rate of more than 150 miles a day, arriving unfatigued and ready for action. In short, such a mode of conveyance gives the maximum of facility to modify plans, to move freely, and to change direction. On the other hand, the railroad is the very worst mode of conveyance, if any sudden change of plans and consequent change of destination of troops is necessary.

Further, a mode of conveyance by power vehicle on the

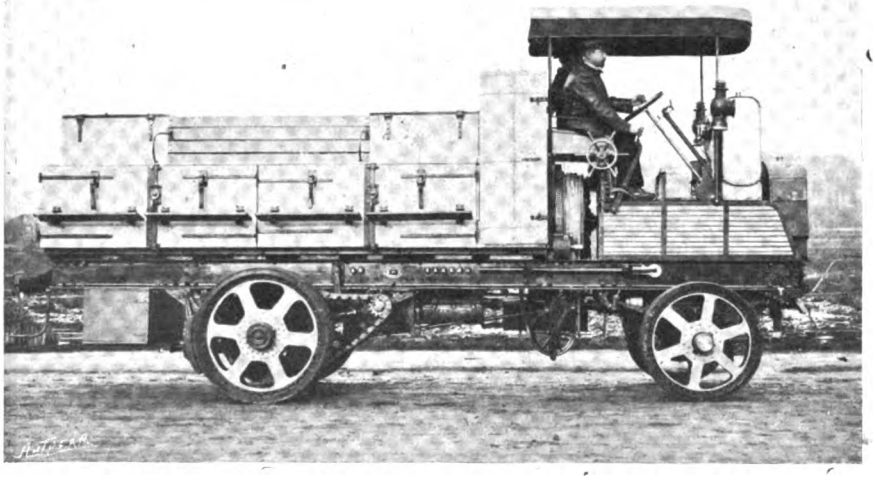
Army Tractor Hauling Battery by Winch and Cable.



Flexibility of Motor Howitzer Battery.



The Portuguese Automobile Howitzer Battery.



Four-Cylinder Tractor of the Portuguese Howitzer Battery Train.

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road would be of great value after the front had been reached in enabling the commander to transfer large bodies of men in any direction he pleased and without an hour's delay. He would have the further advantage of freedom from the necessity of considering any question of fatigue, and would be certain that he could move them from one part of the coast to another by direct journey and at a much higher speed than that which an expeditionary force moving by sea could possibly attain, and bring them to the desired point thoroughly fresh and fit. Nor would he have to consider the condition of animals—always a serious matter in land war operations. His road vehicles would only require overhaul, oiling up and fuel; there would be no need to give time for recuperation of exhausted energy. This would be of priceless value, not only as regards conveyance of troops, but even more as regards transport haulage. There would be no such ghastly and wasteful using up of horseflesh, as so often takes place in war, when at times the salvation of a force and the avoidance of a military disaster can only be effected by a cruel exhaustion of animal power. The power vehicle may be injured or may fail, but it can be towed with its load, and can be mended, whereas the overworked horse must often perish, and the calling upon other horses to do its work as well as their own means still further destruction.

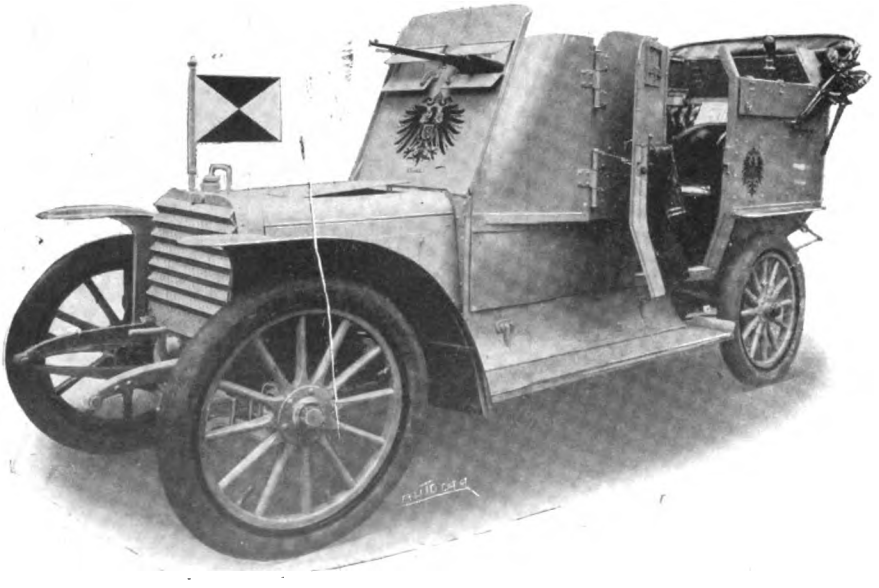
All that I am saying in favor of the power vehicle may seem like an idle dream to those who have not given attention to what is being practically accomplished by power haulage at the present time. But so certain do those who are observant feel that they can confidently say that what is already in actual operation exceeds all that could have been pictured by the wildest dreamer of twenty years ago.

There are many other valuable services which could be rendered by the power vehicle at the scene of conflict, such as towing great guns from place to place, towing field guns when on the road so as to keep the horse teams fresh for over-country work, in heavy ground, and up steep ascents. They would also afford excellent cover to a resisting force in the event of any portion of the enemy succeeding in landing. They could be kept under cover ready for use, and so enable an overwhelmed force to hold on much longer than it otherwise could be allowed to do, the vehicles being ready for rapid withdrawal before an enemy that had no fast conveyance available. The motor vehicle would be to the defending troops what the ponies so often were to the Boers—a means of getting safely out of range when things were becoming critical, of course, with this limit, that they must keep on the roads.

In all that I have said it is only the motor vehicle that is the property of the private citizen or company that has been spoken of, whether it be a carriage for persons or for goods; but, of course, I assume that in the near future, if not already, the war authority will follow the lead of the citizen, and adopt the power vehicle as part of the military organization for purposes connected with war. The adaptability of the heavy power vehicle to many such purposes is indisputable. For rapidly moving machine guns and their teams, for traveling workshops, telegraph and telephone wagons, ambulances, and for conveyance of bulk material between the railways and the camps, the power vehicle can render service far beyond what can be accomplished by animal power. Moreover, a motor vehicle for military purposes can have a capstan drum, which, when put in gear, can be used for warping purposes with block and tackle; steep ascents can be overcome, so that even the heaviest guns can be taken up stiff gradients without difficulty, and trench ploughing can be executed without the necessity for special engines. Motor bicycles can also be used in the regular service for rapid conveyance of intelligence and orders. And all this with the paramount advantage that a commander can be sure that he has abundance of power for conveyance and for mechanical work, without its being an expensive and troublesome burden when idle. A packed mass of power vehicles costs nothing but the price of a little waste and cleaning oil when there is no work to be done, and the vehicles are ready at a minute's notice for work far beyond what could be accomplished by animal haulage.

We are only at the beginning of the utilization of power traction for war. Its possibilities, and especially in national defense, are as yet not to be measured. Every month will bring new light, leading to new developments. Indeed, power vehicles, if we will spend some thought and a little money on organization now, while we have time, will, I venture to predict, prove a most valuable addition to our defensive strength on land. All I can do now is to plead that the question of its value be considered, and if it passes the ordeal of the deep thinking which is now being exercised upon our national needs, that it will not be pigeonholed, to be considered from a practical aspect some day, but that it will be practically dealt with now.

It may be that we shall never have to face an expedition sent to attack us in our own land, but it is a risk against which we are bound to be prepared. One of the cheapest as well as the most practical and efficient departments of preparation would be an organization for utilization of the power vehicle, and I hope I have persuaded you that its use would be of the highest value. It is in the belief that we have in the motor vehicle a powerful addition to our potentialities for defense that my endeavor has been made to interest my countrymen in the consideration of the matter, and I conclude by earnestly com-



Germany Armored Car.

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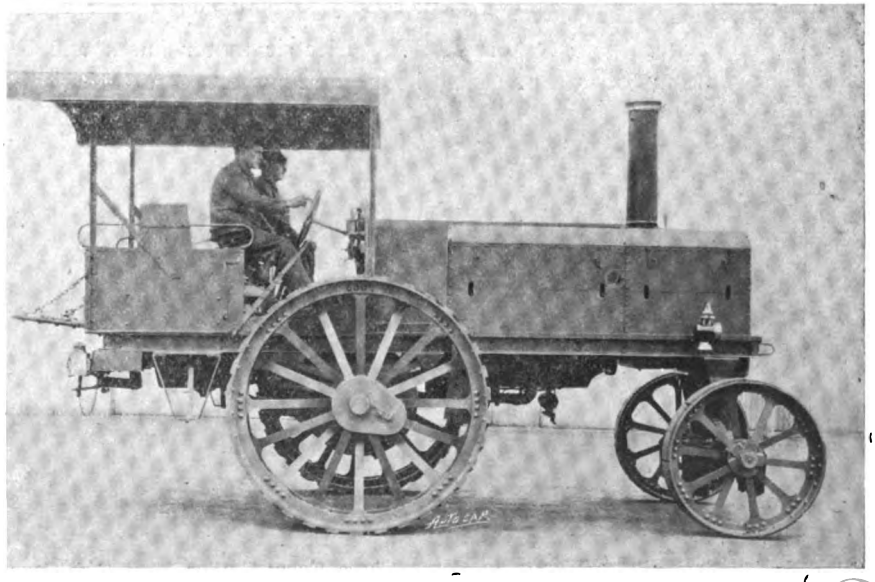
mending it to their attention in the hope that our military authorities may be induced to take it up without delay and on practical lines. Believing, as I do most firmly, that the power road vehicle of today adds enormously to our facilities for effective use of our defensive forces, I would most earnestly press for a consideration of the matter, and if what I have said is accepted as true, would urge that we lose not the benefit of this valuable auxiliary to our power of rapid action on emergeucy, but without delay develop the necessary organization to make it effective.

The British war office has for a long time been familiar with the advantages to be derived from the employment of motor vehicles in active warfare. The much derided, but nevertheless successful experiment with motor tractors in the South African war stimulated a desire to use self-propelled vehicles in the field, and ever since that time the development has been constant. Tractors designed for active service are required to possess qualities far above what would be supposed to exist in vehicles of this kind. For example, not long ago the war office placed an order for two of these machines designed to use gasoline or kerosene and fitted with two cylinder engines of 6 inch bore and 8 inch stroke. One tractor developing 40 hp. at 600 revolutions is guaranteed to pull a gross load of 14 tons on an incline of 1 in 12. Over soft ground it will pull a gross load of 7 tons. It will also pull its load out of the soft ground without the use of the winding gear with which it is fitted. A 25 hp. tractor pulls a 6 ton load and can easily negotiate a gradient of 1 in 8. It is also used to operate a field searchlight. The exhaust in both these tractors is through a funnel. Final drive is by chain to the rear wheels. The maximum speed of the big tractor is 8 miles an hour. The wheels of both vehicles are cast steel. Distinct encouragement is lent to those who are developing vehicles containing engines operated by kerosene or heavy oils.

One of the direct results of the employment of motor tractors in the South African war was the organization of a separate military department which has general supervision over all mechanically propelled vehicles used in the British army. The chief duties of this department are to select suitable vehicles for pacific and hostile service, to provide suitable means for repairing and maintaining them in active service when a permanent base may not be available, and the education of drivers, repairmen and others who may find it necessary to be familiar with the construction and operation of the vehicles. At Aldershot, where one of these army service transport department depots is located, a laboratory is equipped for the technical and theoretical instruction of those attached to the department. In this laboratory are many useful models, patterns and charts, the latter showing the advantages of motor traction in such matters as loads carrying, space occupied, etc., in comparison with loads drawn and space occupied by horse drawn vehicles. Everything which will aid military students of motor traction in acquiring knowledge of its value is contained in this workroom, such, for example, as engines in section, cardboard models explaining the action of carburetters diagrams of clutches, gears, ignition systems, brakes, tires, etc. The general principles of applied mechanics are taught and every effort is bent to instruct pupils in useful knowledge concerning motor traction. Large and commodious new buildings are now being erected to take the place of the cramped quarters in which this instruction is provided. When these buildings are completed they will be equipped with the most improved machinery and practical motor wagon building will be undertaken—as a schooling, of course, for the students. The resourcefulness of the student is called into play upon every opportunity, on the theory that high-class appliances for effecting repairs are not always available in military operations. The Aldershot training school is at present equipped with a foundry, blacksmith shop, hardening plant, machine and erecting shop, inspection pit, test benches, vulcanizing plant, etc. It is little wonder, therefore, that motor road vehicles occupy a great deal of attention in high executive military circles in England.

A year ago the engineer corps of the Portuguese army was supplied with a motor howitzer battery made in the works of a well known French ordnance establishment. The battery consists of a tractor and train of four howitzers



Another Gasoline Military Tractor, Fitted with 6" x 8" Engine.

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the tractor being operated by a gasoline engine capable of moving a 5 ton load on the chassis of the tractor and 15 tons of ordnance at a speed of 3.4 miles per hour over average routes. There is nothing unusual about the mechanism of the tractor, except that it is very strong and is fitted with a winch and cable to enable the howitzer train to surmount grades of about 1 in 8. Heavy steel wheels are fitted to the tractor, the tread of the front wheels being 7 inches wide and the tread of the rear wheels 12 inches wide. The tractor carries ammunition chests as well as the gun crews. This automobile howitzer battery is stationed at Lisbon and in every trial to which it has been submitted has demonstrated its superiority to a horse drawn battery of equal strength.

Five-Ton Gasoline Wagon Used for Carrying Gunpowder—Steel Body.

Every military nation now has its own type of armored motor car, which leads to the belief that in the next great war the portable battery will be conspicuously in evidence. The British armored car is surrounded with bullet-proof armor, flattened at the sides and having a ram fore and aft. It is intended for coast defense. It is in reality a powerful moving fortress, being about 30 feet long, with a speed of fifteen miles an hour; carries fuel for a run of at least 500 miles, and more than 10,000 rounds of ammunition; is armed with two automatic quick-fire guns and two of the famous "pompoms" whose deadly efficiency was demonstrated in the Boer war; can climb a steep grade, and carries searchlights and a crew of twenty specially trained men. The motor-mitrailleuse, as the war car of France is called, vies with similar vehicles already adopted in the German, Italian, Austrian, Russian, and British armies.

CHAIN ADJUSTMENT OF ELECTRIC WAGONS

SIDE chains are adjusted by means of the turnbuckles on the distance rod between countershaft and rear axle, care being taken that each chain is in the same relative position; otherwise the liability is to throw the countershaft out of line, with consequent binding in the bearings. The countershaft should at all times be parallel to the shaft to which it is hung.

Another method is to manipulate the turnbuckle on the distance rod between the axle and battery compartment, but this should not be employed unless the first method does not prove adequate, and then only as an additional means. In doing this care must be taken not to throw the rear axle out of parallel with the front axle. If one distance rod is adjusted more than the other, the wheel base on one side of the wagon would be longer than the other side and cause grinding of the tires and increased current consumption.

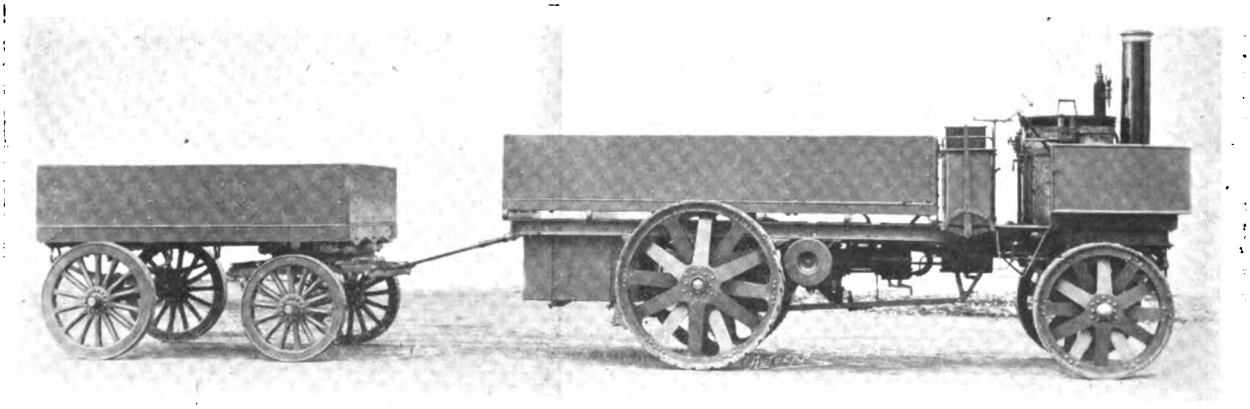
The center chain is adjusted by means of the turnbuckle on the distance rod between motor and countershaft, the motor being hung on a pivot.

A movement is on foot to establish another automobile line for Eagle Pass, Texas. This is intended to ply between Eagle Pass and Carrizo Springs, passing through the town of Cometa, and is expected to carry both freight and passengers. The present auto line between Eagle Pass and Diaz has proved a fine investment from the beginning.

It is proposed to connect Madison and Hanover, Ind., by a motor stage line which will handle passengers and mail.

A company is being formed to operate motor buses between Pecos and Carlsbad, Texas.

Electric motor buses will be operated this summer between Longhorne and Morrisville, Pa.



Standard British Military Wagon to Carry Three Tons; Trailer Load, Two Tons.

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Where Horses Are Not Used

Development of the Tropics and Orient to Follow the Employment of the Motor Wagon

THE applicability of the motor road vehicle, and especially the freight motor, to the development of the tropics and the orient, and its value as a substitute for the horse in all sections where that animal is not available by reason of climatic or other conditions, was discussed in considerable detail by O. P. Austin, chief of the bureau of statistics, in a lecture before the National Geographic Society at Washington, D. C., last month. The title of the lecture was "Queer Transportation Methods," and the purpose of it was to show the possibilities which the motor vehicle now offers for the development of sections of the world in which commerce is backward because of the lack of facilities for transporting merchandise.

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The lecturer took his audience through tropical America, Northern Africa, the Holy Land, India, Burma, the Malayan peninsula, the Philippines, China, Korea and Japan, showing by a large number of illustrations the crude methods utilized—the burro of Mexico, the llama of South America, the sledges of tropical Madeira, the saddle ox of central Africa, the camel of the desert, the donkey of North Africa and Arabia, the bullock cart and the dandy of India, the yak of Tibet, the trotting ox of Ceylon, the elephant of Siam, the carabou of the Philippines, the wheelbarrow and sedan chair of Japan, the pack bull and palanquin of Korea, the jinricksha and kago of Japan, and the coolie freight carrier of the orient.

This problem of the development of the tropics and the orient, which had been so long delayed by reason, in part at least, of the absence of the horse for transportation between the point of production and the common carrier might now, in Mr. Austin's opinion, be solved by the substitution of the motor wagon for the crude methods which prevail in those sections of the world in which the horse is not available and never can be used profitably.

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Of the 100,000,000 horses, more or less, known to exist in the world, he said, 80,000,000 of the entire number are found in the temperate zone, nearly all among occidental people, while the remaining 20,000,000 are largely employed in the service of temperate zone visitors or residents, and are but feeble representativs of that noble animal as he is known to the people of Europe or America. In the United States and Canada we have one horse for every 3½ persons approximately, in South America one for every 7, in Mexico one for every 12, in Japan one for every 33, in Turkey one for every 40, in the Philippine Islands one for every 50, in Africa one for every 150, in India one for every 200, while in southern China, for which no statistics are available, the number is probably even less.

No one who has visited the tropics and the orient can fail to realize the great disadvantage under which man has labored in his attempts to develop exploration, intercommunication and exchange of products; and the great benefits to science and commerce which would come from a satisfactory device which would do for the tropics and the orient what the horse has done for the temperate zone or the occident. Clearly the conditions of transportation in the tropics and the orient are largely due to the absence of the horse. Now comes the question: Can the ingenuity of man provide a substitute for the horse which can be utilized in those areas where the horse cannot exist? This may now be answered in the affirmative.

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For many years man has been experimenting in attempts to transport merchandise and men by a self-propelled machine. He soon learned that he could drive a wheeled vehicle on land by power produced within itself, provided he supplied it with a steel track on which its wheels might run; and with this knowledge the railroads spread over all that part of the world where horses could be found to bring the products of toil to their stations. But until the beginning of the twentieth century man had not solved the problem of operating self-propelled vehicles on ordinary dirt roads or across stretches of country in which no roads exist. That art has at last been attained, and we have today the automobile for pleasure and commerce, the latter moving hundreds of thousands of tons of merchandise over roads of a type which can be supplied everywhere.

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The practicability of applying the self-propelled vehicle to transportation in deserts, in the tropics and the orient has already suggested itself, and the experiments made have already assured success. In the deserts of New Mexico and Arizona motors are successfully worked at temperatures of from 120 to 140, where horses or mules can only be used at night. In Nevada motor trucks are now performing the work of thirty horses each, carrying freights over 100 miles of mountain roads. In California motor cars are carrying over dirt roads in the mountain regions as much ore at each trip as would require 100 pack horses. In Puerto Rico a line of three motor vehicles carries passengers and mails, performing the work of more than a score of vehicles and over 100 horses. Numbers of American motor vehicles have been put on the roads of Cuba and Santa Domingo with success, and more are being ordered. In Honduras American motor trucks are conveying minerals to the seaboard from the mines 100 miles inland, a single automobile truck doing the work of 100 mules. In South America the horseless vehicle is carrying passengers and freights to inland cities at an enormous saving of time and expense. In Egypt the freight and passenger motor is beginning to take the place of the camel, and roads for their use are being constructed through the desert on which the product of the emerald mines will be brought to market. In Turkey motor cars are making regular trips over country roads, carrying both freight and

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passengers. U. S. Consul Michael reports that the Indian government is considering the desirability of utilizing motor transport wagons for moving the products of the outlying districts. Special Agent Crist reports a rapidly increasing use of the automobile in South Africa, especially in the mining regions; that nearly a million dollars' worth of these vehicles were imported in 1906, and that the cost of constructing motor roads is only about one-eighth as much as that of railways. In the Congo the Belgian government is constructing hundreds of miles of roads for the use of the motor in the transportation of freights in that section. In Java an American automobile is being used for the transportation of mails over the country roads of that island. In Japan experiments with the motor car have been so successful that a company has recently been organized in that country with a capital of 10 million yen for the purpose of building and operating vehicles for a general transportation service in Tokyo and thence to the surrounding towns. In the Philippines a line of motors is being put on to carry passengers pending the completion of the railway. A special type of motor vehicle made in France pulls trains for freight and passengers over country roads on the continent as well as Algeria, Central Africa, Chile and Peru. So confident are those acquainted with the motor vehicle and its ability to operate in the tropics and orient that a race from Pekin, China, to Paris, a distance of 9,000 miles across the great Gobi desert, is planned for next June.

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To the suggestion that the motor road vehicle is destined to develop the trade and commerce of the tropics and orient some doubting Thomas may respond that there are no roads over which the machines may be operated. To this we may reply that the plentiful and cheap labor of the tropics and the orient can supply and maintain roads in those sections at no greater expense than in the temperate zone or the occident, and that admixture of temperate zone, occidental energy which has produced 200,000 miles of well-kept roads in India, can do the same in any other part of the tropics or orient where roads may be required to meet the demands of commerce.

MOTOR BUSES IN DUBUQUE

EARLY this month the Idaho Automobile and Electric Transportation Company will commence operations with motor buses in Dubuque, Ia., the service extending to adjacent towns in Wisconsin. Two vehicles will leave Dubuque at the same time every three hours throughout the day, proceeding by different routes and meeting at Cuba, where two feeding cars will carry pasengers from branch lines, one from Lancaster to Platteville and the other from Darlington, Shullsburg and Benton.

The company already has six motor bus lines operating in the State of Idaho, the longest line being 145 miles, while the shortest extends over a distance of 35 miles. In that state the company has several mail contracts and its vehicles are therefore built with a large compartment for mail and express.

The Dubuque buses will be twenty feet and two inches in length and six feet and one-half inch in width. They will have, as a rule, five seats, but those cars which have an express compartment will have four. Besides the two headlights, there will be a searchlight on the front of the car. The company also proposes to operate a line from Dubuque and taking in Cascade, Fillmore, Bernard, Garryowen and Balltown, but work on it will not be begun until The Wisconsin line is in good running order.

Last month an electric hearse having a working radius of 75 miles, was put in service in Berlin. Paris, it will be remembered, has a motor hearse operated by a gasoline engine.

German military experts are debating the establishment of a permanent automobile division in the army, on an equal footing with the railway, telegraph and balloon departments.

LONDON HAS ALMOST 950 MOTOR BUSES

ONE month ago there were 944 motor buses operating in London. At that time the census showed the following distribution:

London Motor Omnibus Co.	219
London General Omnibus Co.	177
London Road Car Co.	175
London Power Omnibus Co.	63
Great Eastern London Motor Omnibus Co.	49
London and District Motor Bus Co.	42
Thomas Tilling	40
Motor Bus Co.	35
Associated Omnibus Co.	29
Star Omnibus Co.	24
Birch Bros.	14
London and Provincial Motor Bus and Traction Co.	11
Miscellaneous owners	66
Total	944

Of this number 519 were manufactured in France and Germany, and the remainder in Great Britain.

An important addition is about to be made to the German army transport department by the creation of a regular automobile section. The duties of this section will be to test the efficiency and safety of motor vehicles as a means of transport under actual war conditions, and train a special body of men to be known as the Automobile Corps.

A motor freight and passenger service has been established between Pueblo, Colo., and Chicorsa, Hastings, Tobasco, Berwind, Suffield and Bowen camps in the mining country. One round trip is made daily.

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Gasoline Cab Profits

From the Operation of 500 Machines Net Annual Profit of $438,000 is Calculated

THE greatest activity is being displayed abroad in the manufacture and operation of gasoline motor cabs, early experiments made with these vehicles having justified the investment of capital in their production and use. In all of the large industrial centers the horse is fated to disappear from public service.

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Factories which are in position to make vehicles of this type are submerged with orders, the Renault and Darracq establishments in particular having more business booked than they can take care of in two years. The Darracq Company proposes to put 1,200 motor cabs on the streets of four capital cities of the world, 500 in London, 300 in Paris, 200 in Berlin, 100 in Vienna and 100 in Bombay. Two models are being constructed, one with two-cylinder engine developing 12 hp. and the other with four-cylinder engine developing 18 hp. Both models will be fitted with pressed steel frames, narrowed in front, engine cylinders cast in pairs, and will be provided with three forward speeds and a reverse operated by a lever under the steering wheel. High tension magneto ignition will be employed. The high powered cabs will weigh about 2,200 pounds, and will have a longer wheel base than the low powered machines. It is stated that the motor cab output of the Darracq factory will be 2,500 this year. Clement, Renault, Richard, and the C. G. V. Company are building motor cabs upon an equally large scale.

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Among the operators of motor cabs the United Motor Cab Company, of London, with capital stock of $1,265,000 disputes with the General Motor Cab Company, which has a capital stock of $2,500,000, the honor of being regarded as the most important foreign organization engaged in minor road motor passenger transport. The United Company, which takes its names from the fact that it has acquired the businesses of several small motor cab companies, has ordered 500 gasoline cabs from French manufacturers. The United and General companies are closely affiliated, the latter owning a large block of the former's stock. The United Company has bought 250 Unic cabs, 250 Darracq cabs, both for public hire, and 50 Charron cars for private hire.

The Unic cabs, exclusive of tires and taximeters, will cost $1,270 apiece. The Darracq cabs, for which the United Company has secured the sole right of purchase until June, 1908, with right of yearly renewal, will cost $1,400 apiece complete. The Charron cars, which are fitted with 14 hp. engines, will cost $2,500 apiece complete.

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The average cash daily takings per vehicle in the United Motor Cab Company's service amounts to $8.64. A conservative estimate of the profits and operating expenses of the United company's enterprise is shown in the following tables, which are based upon actual operations of one of the minor companies it has absorbed. Earning expenses and profits are calculated upon the basis of operating five hundred cabs:

Earnings

Receipts per cab per day	$8.64
Less 25 per cent for drivers' wages and gasoline	2.16
Gross profit per cab per day	$6.48

Expenses

CALCULATED UPON BASIS OF 500 CABS.

	Per cab per day	500 cabs per annum
Management, general expense, insurance and garage	$0.48	$ 72,000
Cleaning	.20	30,000
Tires	1.08	162,000
Upkeep of motor	.48	72,000
Upkeep of bodies	.36	54,000
Oils	.10	15,000
	$2.70	$405,000

Tire, motor, body and oil expenses are calculated on the basis of each cab covering a sufficient mileage to earn the $8.64 per day gross.

Recapitulation

Average gross profits per cab per day		$6.48
Average working expenses per cab per day		2.70
Balance profit		$3.78
500 cabs at $3.78 net profit per cab per day		$567,000
Less agreed price, $33.60 per annum per cab for use and maintenance of taximeters, 500 cabs	$16,800	
Licenses, $13.20 per annum per cab for 500 cabs	6,600	
Depreciation of entire cost over a period of six years, say $211.20 per cab, 500 cabs	105,600	
		129,000
Balance, net profit		$438,000

In addition to the above there is to be taken into consideration the earning of 50 private hire cabs, which should find suitable employment at an average revenue of $288 per month per vehicle.

50 private hire cabs per annum	$172,800
Deduct wages, gasoline, etc., per annum	79,920
Profit	$92,880

This, with estimated net profit of $438,000 to be derived from the working of 500 public cabs, would leave a total net profit per annum of $530,880.

* * *

The General Motor Cab Company is preparing to place 1,100 taximeter gasoline cabs on the streets of London. It is already operating 300 vehicles and has built an immense garage occupying 3½ acres which is to be still further enlarged when workshops for repairs can be erected and equipped. A very ingenious device for precipitating large quantities of sand on the gasoline tanks in case of fire is one of the features of the garage.

The vehicles operated by the General company are comfortable and attractive landaulets, constructed so as to be used open or closed and accommodate four passengers. The engines develop 8 hp. The vehicles have a maximum speed of 24 miles an hour. The interiors are furnished with mouthpieces through which instructions can be given to the drivers.

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The cab operators are dressed at the company's expense in military blue-grey uniforms, and are taught to drive in an 800 foot private roadway inside the garage. Drivers are recruited from the horse cab ranks, owing to the knowledge which such men possess of the intricacies of London streets. Like the drivers of the United company's vehicles, operators of the General company's machines are paid 25 per cent of their gross takings, out of which they purchase gasoline from the operating company at net cost. A gallon of gasoline, costing 22 cents, is supposed to last while a vehicle is covering from 18 to 20 miles. The cab men's union, however, is urging the company's drivers to demand a fixed daily wage of $1.20 per day and 10 per cent of the gross receipts, and, as if this was not enough, insists upon fuel being furnished free. As a compromise the General Company offered to pay a daily wage of $1.68, out of which the men should pay for their gasoline. The offer was refused, and the company now insists upon its men accepting 25 per cent of their gross takings as full payment for their services. The cab driver's union contends that the percentage plan of payment is unfair to the drivers since while good wages can be earned in pleasant weather, low earnings must be the rule in severe wather.

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Motor cab fares are regulated in London by act of parliament. It is proposed that after July 1 the fare for a motor cab fitted with taximeter shall be 16 cents for one mile. The same fare will be charged for a journey not exceeding ten minutes in duration. For each additional quarter mile, or for a period of time not exceeding two and one-half minutes, the charge will be 4 cents. Vehicles must be driven as fast as ordinary fast moving traffic. Cab operators are permitted to charge extra for baggage, 4 cents being the charge for each package if carried outside of the passenger compartment. All of these charges apply within a four mile radius. No legislation has yet been considered to govern charges where motor cab drivers may be required to go beyond the four mile radius. When, therefore, passengers require to be transported greater lengths it is assumed that charge will be made according to the time consumed. .....

THOMAS COMPANY TO MAKE CABS

AFTER a year of secret and well-guarded activity the E. R. Thomas Motor Company of Buffalo, through its Chicago agent, has announced its intention to manufacture motor cabs. Gustave Chedru, formerly chief designer and general superintendent of the De Dion, Clement-Bayard and Richard Brasier factories in France, has been at work for nearly a year for President Thomas, and the former technical adviser of the Automobile Club of France has learned so much about the need and uses of motor cabs that the Buffalo concern is prepared to build such vehicles after his design.

BIG EUROPEAN CAB COMPANY

WITH a capital of $2,500,000 a company has been organized at Copenhagen, Denmark, for the purpose of operating motor cabs in Russia and Scandinavian cities, Berlin, Paris and other large European centers. The title of the concern is Continental Motor Cabs, Limited. Headquarters of the company will be in Paris. The greatest portion of the capital, it is stated, has been subscribed in England, France, and Russia, with some small amounts from Scandinavia.

ELECTRIC CABS IN BUENOS AYRES

ELECTRIC cabs will soon be plying for fare in Buenos Ayres, permission having been granted to the National Electric Carriage Company to place twenty such vehicles on the streets of the city. The company's charter for operation may be withdrawn without notice if the service should prove unsatisfactory.

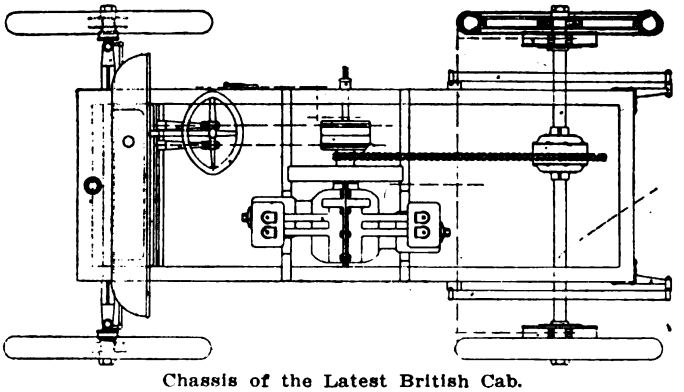
The Milwaukee fire department is considering the employment of automobile chemical fire engines.

LONDON'S TAXIMETER CABS

ONE of the motor cab companies operating in London has erected a garage capable of housing 1,000 vehicles. The building contains two floors, the lower for storage of vehicles, and the upper for repairing, painting, etc. Seventy cabs are now in operation.

Another company, also operating in and around London, has just declared a dividend of 5 per cent on a capitalization of $125,000. This company is to be merged in the United Motor Cab Company, Limited, of which consolidation mention is made elsewhere.

The motor cab chassis shown in the accompanying illustration is the latest put upon the British market. It



Chassis of the Latest British Cab.

is operated by a two cylinder horizontal engine, epicyclic gears, the final drive being by single chain. Valves are enclosed. The cab is capable of being turned in a 20-foot roadway. The drawing of this cab is reproduced from a recent issue of the Industrial Motor Review.

A company has been formed to operate small and light motor buses in and around Paris. The uniform passenger fare will be two cents.

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Railway Feeders

The Pennsylvania Railway Company Does Not Favor the Employment of Motor Buses

BEING curious to know if the British custom of feeding main lines of railway travel with motor buses could be applied in this country the Pennsylvania Railway Company last fall commissioned a committee of its higher officials to go abroad, observe carefully what was to be seen and report to the general manager. This committee was composed of C. M. Sheaffer, superintendent of passenger transportation; R. N. Durborow, superintendent of motive power, and A. E. Buchanan, chief clerk to the general passenger agent. After inspecting the principal railway systems of England Ireland, Scotland, Germany, France, Belgium, Holland, Italy and Switzerland the following report was submitted:

The road motors for passenger service are simply automobile omnibuses of various types, the cost varying from $3,000 to $5,000, some of them having double decks, and in many cases small compartments for the accommodation of luggage and parcels. Machines of this character have been introduced to a greater or less extent by the following railways:

London and North Western Railway Company.
Great Western Railway Company,
London and South Western Railway Company,
Great Eastern Railway Company,
Caledonian Railway Company.

Frequent road motor service has been established at points where there are villages not located on the railways, but with sufficient population to warrant the service, also from stations on the main line, as well as from the terminus of one branch line to that of another. These motors are operated on advertised schedules, at a maximum speed of fifteen miles per hour. The routes covered range from three to twenty miles in length, and the tariff rates for passengers, luggage and parcels are published, no distinction being made as to class. A storekeeper in each village is employed as the agent for the company.

The established schedules are maintained with a fair degree of regularity; the service is well patronized, and is appreciated by those depending upon it. However, your committee failed to find, at any of the places visited, very much enthusiasm expressed in regard to the road motor proposition from a railroad standpoint, some of the railway officials stating that they did not consider this character of service a proper function of a steam railway company. In some cases negotiations were under way with independent automobile omnibus companies to take over and operate the road motor service; and, further, we failed to find any road motors in operation or contemplated in connection with any of the Continental railways.

We observed the performance of road motors of the London and North Western Railway in operation between Harrow and London, covering a distance of seven miles.

The Great Western Railway of England, on account of the numerous small towns and villages adjacent to its lines, is the largest user of road motors, owning eighty-four machines and operating them on forty-four established lines. We inspected the service between Slough and Stoke-Pogis, a distance of ten miles the round trip. The car used was equipped with a four-cylinder gasoline engine, and had a carrying capacity of twenty persons. Steam road motors have been tried on this line, but were unsuccessful on account of boiler troubles, and they have been abandoned. The London and South Western Railway has four steam road motors, which are considered quite unsatisfactory.

The Great Eastern Railway has eighteen motors, including ten built by themselves. The cars have double decks and each seats thirty-eight persons. The Caledonian Railway of Scotland has two road motors in service a few miles from Glasgow, between Clarkston and Eaglesham, a distance of eight miles.

It was noted that wherever steam has been used for the operation of road motors they have proven unsatisfactory, and that gasoline machines are the most successfully operated.

From our personal observation and the information obtained as to the conditions existing under which road motor service has been established and operated in Great Britain, and with our knowledge of the general condition existing in the territory traversed by our line, it is the opinion of your committee that the establishment of this character of service as an adjunct to our railway passenger business is not worthy of any serious consideration at this time, and it is our judgment that the same cannot be successfully or profitably operated, on account of the general bad condition of the roads, severe climate and the territory not at present covered by trolley lines being so sparsely settled as to make such service unnecessary and unwarranted.

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From the closing paragraph of this report a careless reader might be tempted to conclude that the last word had been spoken in condemnation of the motor bus as a feeder to main lines of travel. He might even form the impression that such service was not profitable anywhere. Regarded critically, however, it becomes evident that it is merely intended to convey the impression that the Pennsylvania company is averse to employing the road motor vehicle as an auxiliary. This is very far from implying that it would refuse to carry passengers who were transported to its lines by means of road motors. A few years ago the same frosty indifference was expressed toward the interurban trolley lines which tapped the steam railroads. Today, when trolley lines are paralleling steam roads, the latter are becoming uneasy over the diversion of passenger traffic and seeking by all means in their power to recover control of it. High frequency service is out of the question so long as train units are large. The individual motor rail coach would be useful, but there is the matter of trackage and still further congestion than exists today to be considered.

That the motor bus as a feeder to steam and electric railway service is not unprofitable, whether the region it traverses is thickly or thinly settled, is plain from the great number of instances in which it is so employed both here and abroad. It is the inaccessibility of the railroad which furnishes opportunity for the motor bus. It was the prosperous contentment of the steam roads which furnished opportunity for the trolley lines. The motor bus, like the steam and trolley lines, will develop traffic wherever it goes and flourish at the expense of both. It is here to stay and to help the railroads whether their investigating committees wish it or not.

A motor bus line is now in operation between the Union depot in Alliance, O., and Mount Union. Half-hour trips are made, with stops at each intersection along the main thoroughfare.

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Main Floor of British Industrial Motor Vehicle Exhibition.

Epochal Trade Event

First Exclusive Exhibition of Industrial Motor Vehicles Held by British Makers

AN exhibition exclusively composed of industrial motor vehicles—the first of its kind ever witnessed—was held in London during nine days of the early part of March. The show was the result of a unanimous trade decision to give each branch of the automobile industry the freest opportunity for displaying the progress which is being made. Instead of encouraging the artificial brilliance of the one to pale the more substantial merit of the other, each will hereafter stage its own glory, cultivate its own patrons, and thrive or wither as destiny may decide. We have no misgivings for the future of the industrial motor road vehicle. Its large economy insures its permanency.

* * *

In order that readers may quickly comprehend the magnitude of the British commercial automobile industry, we present the following statistics of exhibits:

Merchandise Vehicle Exhibits

Light and heavy motor wagons	105
Motor lorrys	31
Motor tractors	5
Motor tri-cars	2
Total	143

Passenger Vehicle Exhibits

Motor buses	40
Salesmen's motor broughams	11
Motor cabs	9
Motor char-a-bancs	8
Motor ambulances	3
Total	71

Motive Power Classifications

Gasoline	160
Steam	21
Electric	6
Kerosene	5
Gasoline-Electric	2

* * *

Those who have doubted the value of such an exhibition will be surprised to learn that almost without exception the exhibitors profess to have been gratified at the business results achieved. The attendance was not large, but what it lacked in quantity it more than made up in quality. Only those interested in the evolution which is taking place in minor transportation were present to inspect the varied character of the exhibits. The aisles were not thronged, as at touring car exhibitions, with crowds of people possessing small means to gratify their expensive desires. Every visitor was bent on gaining enlightenment, transacting business, or studying the developments of an industry which in a brief space of time will be among the world's greatest. So profound was the interest which the exhibition excited among the thoughtful classes that the *London Times*, a staid publication not given to gushing over every event which it chronicles, was moved to remark:

> This exhibition is important because the world is now in sober truth seeing and feeling the first stages of a revolution in the methods of transporting passengers and goods of all kinds at least equal in importance to, perhaps more complete than, that which came with the introduction of the railway systems. This is a wide and an unreserved statement, but, after a great deal of critical reflection, it still commends itself as being indisputably true. It has been demonstrated already with regard to many classes of transport business that what may be called, for the

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sake of convenience the self-propelled vehicle is economically superior to the vehicle drawn by an animal or by several animals, and "thousands of bright brains" are occupied in pondering the problems of detail which remain to be solved before the economical superiority of nearly all self-propelled traffic to that which is horse-drawn is acknowledged over a wider field than it is at present.

The process of solution naturally goes on rapidly, for the advantages of the machine are of an incontestable kind.

The essential point for the present is that the public is alive to the value of self-propelled traffic for purposes of commerce no less than for those of pleasure. In the great towns, and, for that matter, in the small ones too, there is a growing demand for motor cabs, in spite of the extortion for which motor cabmen have become, justly or unjustly, notorious. Corporations, municipal and trading, are anxious to secure motor omnibuses. Tradesmen of all kinds are in search of delivery vans appropriate to their needs; brewers are on the lookout for the best and most economical drays; coal merchants, builders, shippers, engineering contractors—in a phrase, all classes of the commercial community into whose business it enters to carry goods at all—are on the alert to obtain the best and most economical type of vehicle suited to their purpose. This is not by any means an idle dream. It is a faithful impression of the mood of commercial men, gathered by one whose occupations bring him into frequent contact with all classes of them.

There is no doubt that the exhibition is sufficiently comprehensive and representative to enable the visitor who knows the subject at all to study the "state of the art," as the inventors say, in a fairly adequate fashion, and to realize that in motor vehicles for the transport of heavy goods on roads the country which was nursing mother to Hancock and Gurney still leads the world.

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While the bulk of the vehicles shown were of British origin, a considerable number of European machines were staged. More than seventy distinct types of British built gasoline and steam vehicles were exhibited. When one pauses to remember that five years ago makers of industrial motor vehicles in England could be counted on one hand he is impressed with an industry which since that time has made such progress as we have just recorded. The progress of the American industrial motor vehicle industry is even more remarkable, particularly if judged from the viewpoint of one solely interested in the transportation of merchandise by power wagons. British power wagon construction, by the way, seems to have been retarded as a result of the extraordinary efforts put forth in order to accomplish the introduction of the motor bus. The performance of the motor bus is scrutinized with unusual closeness. Its shortcomings, which are unfairly imputed to the motor wagon, are known and widely criticised. The same shortcomings might be visible in a motor wagon and yet would not operate to the disadvantage of its owner. As a matter of fact, the English wagon, when well applied and administered, is quite as profitable in service as any wagon in this country. The lesson in this for American manufacturers is to continue as they have begun, first developing motor merchandise transport, and when that is well under way, developing motor passenger traffic.

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No one expected that the exhibition would disclose any unheralded wonder in the way of construction. The designs that are now in general use for wagon or bus work will in all probability continue for years to come, with engineers doing their best to refine the details of construction as opportunity permits. Industrial motor vehicles shows should not be occasions for exploiting invention. If buyers at large once become imbued with the idea that each year must produce its batch of new models, as has been the rule at pleasure car shows, it is likely that the bulk of them will wait until the day of perfect mechanical construction is a little closer than at the present moment, and only those will purchase freely who have the good sense to perceive that almost any vehicle of orthodox design, if suitably applied and well cared for, can at this moment be operated for less money than horse-drawn wagons. Industrial motor vehicle shows, therefore, should be broadly educative rather than narrowly competitive.

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Critics of the British industry have observed that manufacturers, following the merchandising instinct, are too much inclined to compete for trade on price alone, overlooking the fact that service is of paramount importance and that quality cannot be harmonized with low first cost. Broadly considering the economy of all classes of commercial motor vehicles one is tempted to say that the price at which they are sold is too low if improvements are to be made only at the expense of the manufacturer. The price at which an article of great merit is sold should be of secondary importance with those who purchase it for its economy, provided the cost is not so high as to unnecessarily prolong the period within which the investment may be recovered. Besides it is to be borne in mind that a low list price is no guarantee of low vehicle maintenance. Cheap articles are often dearest.

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British motor wagon designers lean strongly toward the employment of two-cylinder engines. As yet they do not appear to have made use of the two-cycle principle. Cheaper construction, lighter weight and greater platform area are among the reasons assigned for the prevalence of the two-cylinder engine. While at present three speeds are the rule, there are indications that before long two speeds will become general. Splash lubrication, which is objectionable on account of its costliness and inefficiency, is another feature of present day motor wagon design in Great Britain. Tube radiators are preferred to the honeycomb type. Only one firm is using a horizontal engine. One house places its vertical engine to one side of the driver's seat in order to give a large platform area on a short wheel base.

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Gasoline wagons to carry from one to one and one-half tons are listed all the way from $1,250 to $1,500. A two-ton gasoline wagon may be obtained for $2,400 to $2,750, fitted with two-cylinder engine. These prices are considered low. A two-ton steam wagon costs $3,850.

Electric vehicles of any kind are scarce in England; in fact their manufacture has just begun. The gasoline-electric combination is being developed with considerable zeal, but as yet the cost of running the vehicles equipped with such power plant is high.

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The competition between steam and gasoline or paraffin as prime-movers is fast taking definite lines. One of the most interesting developments of the gasoline vehicle was a machine which for some months has run with loads of ten tons. The tare weight of the vehicle is no more than that of a steam lorry, and the fuel consumption is said to be very low. The most remarkable feature of the machine, however, is the low speed engine which develops forty-five horse power at only four hundred revolutions per minute. Another interesting machine was a five-ton lorry driven by a four-cylinder engine with a start-cold paraffin carburetor. The engine develops its maximum power of forty horse power at eight hundred revolutions per minute. The disparity between the engine speeds and the loads is distinctly startling, proving that a very low speed internal combustion engine is the most effective opponent of the steam lorry. For certain classes of work the latter is undoubtedly the favorite at present, but how long this position will be maintained is doubtful.

Twenty-one steam vehicles were shown by fourteen makers. The load capacity of these machines is usually ten tons, six tons on platform and four on trailer. The design of these steamers is on much the same lines for the various makes—vertical fire tube boiler, horizontal compound engine, two forward speeds by a sliding spur wheel, gear box with dog clutches for the changes, control by a simple throttle and link motion for varying the steam cut-off, reverse by admission of steam behind the pistons, and drive to the road wheels, either by a single 2½-inch pitch roller chain to live axle or two other chains to solid rear axle. The most noticeable advance on the steamers was in wheel construction, by the substitution of very heavy and numerous wooden spokes with wood felloes and steel rims for the cast steel wheels hitherto employed. The diameter of the wheels and width of tire is governed by legislative enactment, depending upon the maximum weight of machine and load, the usual size for the machines exhibited being 36-inch diameter with 6-inch tires for the front wheels, and 39-inch diameter with 10-inch tires for the rear wheels.

MOTOR MAIL STAGE

SOME interesting particulars of the automobile mail and stage service between Roswell and Torrence, N. M., are furnished by one of the drivers of the vehicles employed. The daily distance covered by each machine is 110 miles, the two points being that far apart.

The line has been in operation since January 10, 1906, and in that time has carried mails and passengers. The government time limit for the trip is nine hours going and eight hours returning. There is a difference of over 3,500 feet in the altitude between Roswell and Torrance. An average speed of twenty miles an hour is maintained, the average time of the trip being about six hours.

"There was plenty of snow along the route during the latter part of my term of service," says the driver. "Three cars are used in relaying the mail, one being stationed at Needmore, which is the half-way station. There drivers as well as cars are changed, one going on to Torrance and another returning to Roswell. Usually about 400 pounds of mail is carried, and three or four passengers with their hand baggage.

"Snow has been the greatest impediment the line has had to contend with, but at that the service has been more reliable than that furnished by the railroads. When the service was first inaugurated there was twenty-four inches of snow on the ground, yet the machines got through three days earlier than the trains—that is, they hauled the mail through days ahead of the railroad, which had to go three times the distance and in a roundabout way. In the summer the trip was fun. It was hot, but we soon got used to the sun. The record for the 110 miles is 4 hours and 15 minutes."

INTER-CITY MOTOR TRUCKING

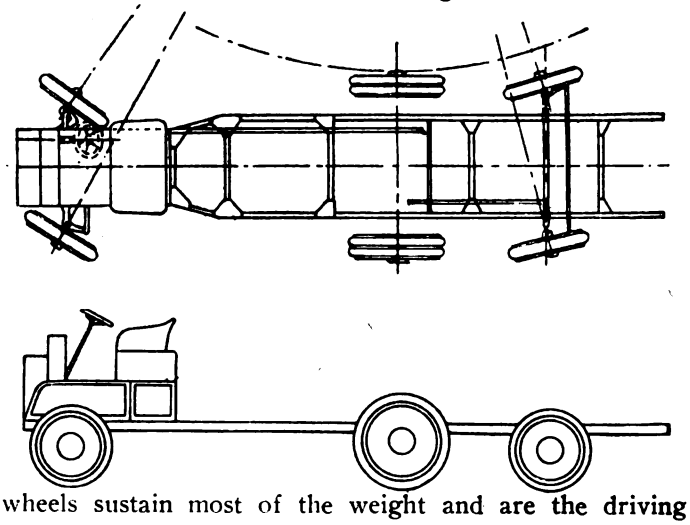
FREIGHT and express matter is to be hauled in motor trucks between St. Paul and Minneapolis by a company which in the summer months will also operate sight-seeing cars. Experienced men are at the head of the enterprise. The traffic between the two cities is abundantly large enough to justify the installation of a motor trucking service.

HYDRAULIC TRANSMISSION

ONE of our consuls in Germany describes an interesting system for the transmission of power in automobiles, oil being compressed by a pump driven by the motor and conveyed in tubes to the rear axle. The rear axle is constructed somewhat in the manner of a double turbine, each turbine operating its own driving wheel independent of the other. In this manner the differential and the gear box for changes of speeds are dispensed with. The tubes conveying the oil to the rear axle are fitted with a by-pass valve governed by a lever, which allows a portion of the oil to be returned to the tank, and in this manner the regulation of the speed is effected.

SIX WHEEL MOTOR BUS

THE six-wheel motor bus is being given a trial in Paris by the company which monopolizes omnibus traffic. The front and rear wheels are steering wheels. The center



wheels sustain most of the weight and are the driving wheels. The tires on the center wheels are twice as wide as those on the front and rear wheels.

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WHERE THERE'S A WILL THERE'S A WAY

BY this time the business world is pretty well acquainted with the fact that the chief postal executives at Washington are determined to supersede horse drawn mail wagons with motor vehicles wherever the substitution can be accomplished with advantage. The first assistant postmaster general has in many ways shown that he is one of the ablest and most progressive administrators ever put in charge of an important branch of governmental service. It is not alone the favor he shows to the motor wagon which educes this opinion, but the broadly intelligent manner in which he deals with every matter calculated to improve the postal service. He is a prodigious worker, and it is largely due to his efforts that the department has been organized on a modern business basis and sweeping reforms made, all tending to greatly facilitate the handling and dispatch of the mails.

Soon after he was appointed to his present post Mr. Hitchcock, having observed the spreading use of motor wagons in commerce, fell to wondering why they were not extensively employed in mail collecting. Puzzled at the apathy which had existed prior to his acceptance of office, he summoned the official having the delivery service in charge and said:

"Why can't we use automobiles in making collections? Business men are using them to advantage. Why shouldn't the government do the same thing?"

"We can't do it, sir," was the reply.

"Why not?" questioned Mr. Hitchcock.

"Because," said the official, "horses and wagons are bought under the 'horse hire' appropriation, and surely you would not say that automobiles could be classified as 'horse hire.'"

"Does the appropriation say anything about wagons?"

"No."

"Then buy or hire automobiles," said Mr. Hitchcock. "The purpose of the law is to have the mail collected, and it may be better done with automobiles than with wagons. If wagons have been construed as horse hire, why not automobiles?"

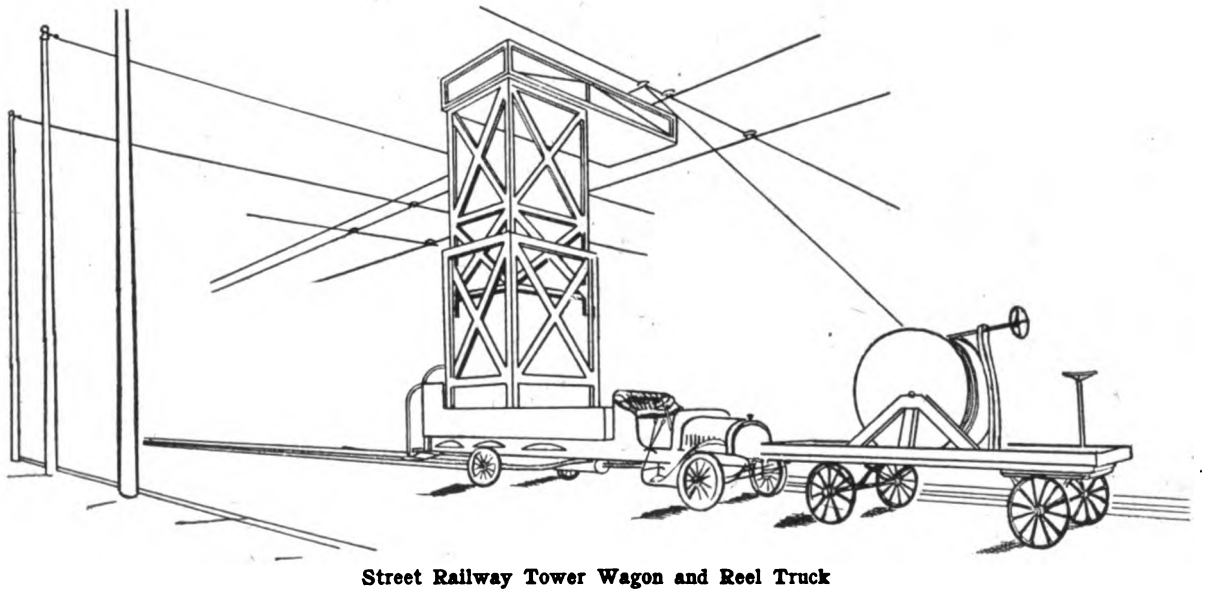
MUNICIPAL TRUCKS IN CINCINNATI

THE superintendent of the street cleaning department in Cincinnati has about decided to make use of 7-ton motor trucks in hauling refuse from the dumping stations which it is expected the city will authorize to be constructed. An ordinance for a bond issue of $149,000 for the purchase of six trucks and the establishment of two dumping stations has already been presented to the council. The superintendent estimates that the six trucks can be purchased for $32,000. He declares it would be useless to purchase them unless the establishment of the dumping stations is authorized. He calculates that $22,500 can be saved annually by following his recommendation.

RISE IN HORSE TRANSPORTATION CHARGES

FOLLOWING the rise in the cost of horses, wagons, harness, labor, feed and other things necessary in the operation of horse transportation, the cartage companies of Chicago and other large cities have served notice upon their customers that they cannot continue to do business at the old rates. The new rates for service approximate a 15 per cent advance. This is so much clear gain for the power wagon.

Rochester, N. Y., will soon be supplied with its third motor patrol wagon.



Street Railway Tower Wagon and Reel Truck

THE special advantages of the motor tower wagon are speed in reaching and returning from the scene of operation, dispatch and steadiness in making forward or backward movements, ability to move either way in a straight line, and economy of operation gained through continuous work and independence of horses. The vehicle shown above was recently put into commission by the Toronto Railway Company. It cost $3600, duty included. It is fitted with an engine which developes 16 hp. when running at 900 r. p. m. The weight of the machine is 3200 pounds and its load capacity is 2½ tons. Speeds range from three to eighteen miles per hour. For use in stringing trolley wire the railway company has devised a reel truck with steering handle that may be either pushed ahead or behind by the motor. The wire from the reel leads up over the tower, where it is fastened to the span.

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Information For Buyers

"Simplicity" Transmission

THIS device, used in the motor vehicles made by the Evansville Automobile Co., Evansville, Ind., is known as the balanced double rolling traction (erroneously called friction) transmission. Two large discs are bolted to flanges forged on the engine shaft, which take the place of a balance wheel. Between these two discs are two driven wheels which operate two countershafts, on the ends of which are sprockets carrying chains to each rear wheel. By a slight movement of a lever these driven wheels are brought in contact with discs; transversely (each on opposite discs) the countershafts revolve, thus propelling the vehicle, and by sliding the driven wheels simultaneously from near the center of the discs to the periphery great speed is attained, while at or near the center great power and slow speed; therefore any speed may be obtained highest to lowest. By merely reversing the direction of the lever the driven wheels are brought into contact at opposite points, giving the reverse direction of the vehicle the same advantageous features as above. This transmission can also be used in an emergency as a brake, if the driven wheels are placed near the center of discs, by reversing the lever in the opposte direction from which the vehicle is moving. It is difficult to damage this transmission in any way.

GROCER'S ELECTRIC TRUCK.—The W. P. Southworth Co., of Cleveland, has bought a three and one half ton Studebaker electric truck which will be used in hauling freight from depots and merchandise to the company's branch store. The box of the vehicle is 10 feet 9 inches long and 50 inches wide.

NEW FACTORY SITE.—The Carter Motor Car Corporation of Detroit, Mich., and Washington, D. C., has selected a tract of land at Berwyn, Md., upon which it will erect a factory. The company makes light delivery wagons as well as touring cars. The sum of $100,000 will be spent for buildings and plant.

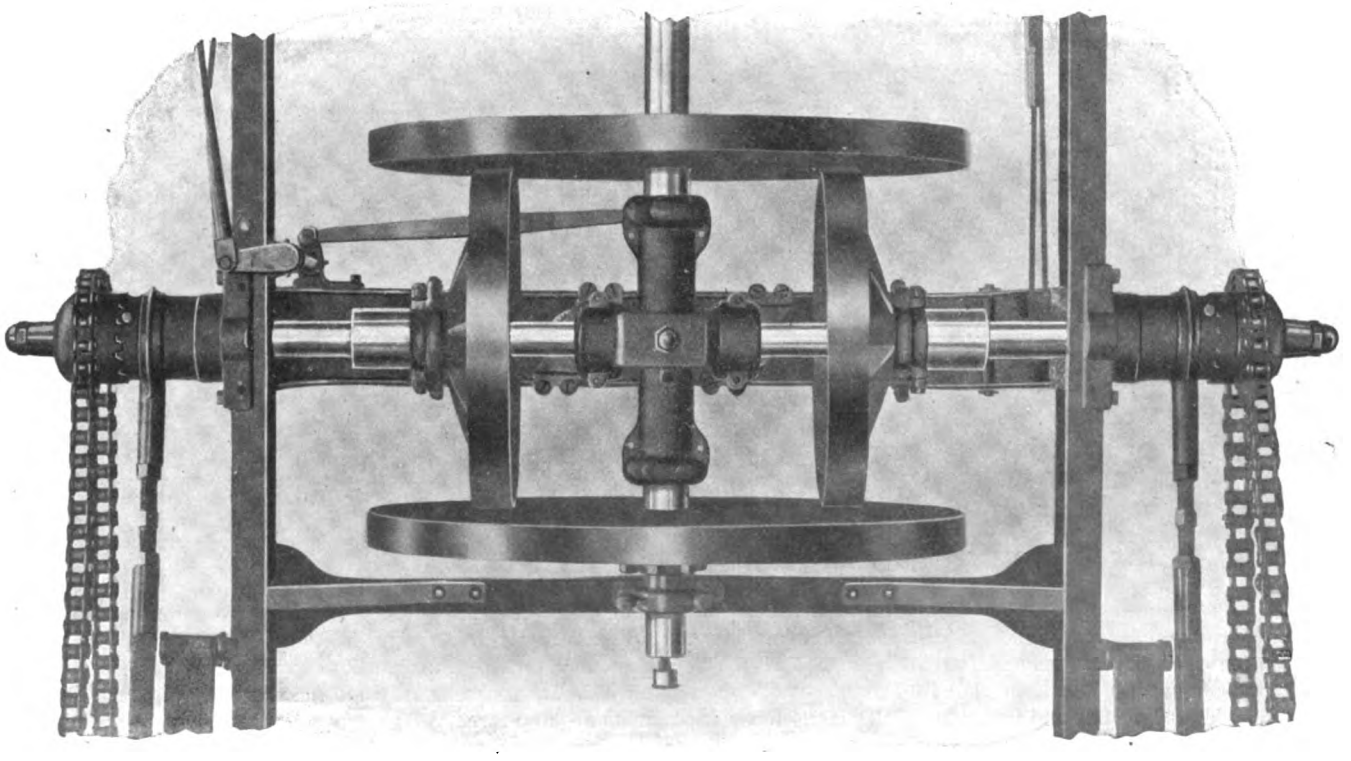
NEW TIRE.—A new tire for commercial motor vehicles, very striking in appearance because it is made of white rubber, and for which much is claimed, has been developed by The Diamond Rubber Company. The tire is made in the well-known side wire type. It is extremely resilient, due in part to the fact that it is made entirely of new and very elastic rubber. This, of course, is a factor tending to reduce the consumption of power and consequently increases the mileage, particularly that of electric vehicles.

DRY GOODS HOUSE BUYS MORE WAGONS.—Arnold, Constable & Company, of New York City, one of the largest dry goods concerns in the country, has just purchased four gasoline delivery wagons made by the Maxwell-Briscoe Company, of Tarrytown, N. Y. The Arnold, Constable Company was one of the first concerns in the country to employ motor wagons in the delivery of merchandise, buying electric machines. Some time ago they replaced 33 horses with nine electric wagons, all of which are giving satisfaction in the service in which their limited battery capacity compels them to be operated. The company's purpose in purchasing gasoline wagons is to cover the outlying districts. The Maxwell-Briscoe wagon is equipped with 16-20 hp. engines.

MOTOR BUSES FOR THE WEST.—The Rapid Vehicle Company, of Pontiac, Mich., has secured an order for a number of motor buses from the Idaho Auto and Electric Transportation Company, which company operates stage lines in Iowa, Idaho, South Dakota, Utah, Oregon and Washington. The company carries mail for the government as well as passengers and express matter. The cars are to be equipped with electric light operated by dynamo connected with the engine.

SELLING TIRES IN THE NORTHWEST.—The Firestone Tire & Rubber Company recently acquired the services of W. R. Walton, formerly traveling out of Chicago as Wisconsin representative of the Fisk Rubber Company. Mr. Walton will call upon customers in the northwest.

ELECTRIC VEHICLE PARADE.—At the recent automobile parade in Indianapolis, held by the dealers of that city, the Pope Motor Car Company made an excellent showing, having in line fourteen of their



Balanced Double Rolling Traction Transmission Made by Evansville Automobile Co.

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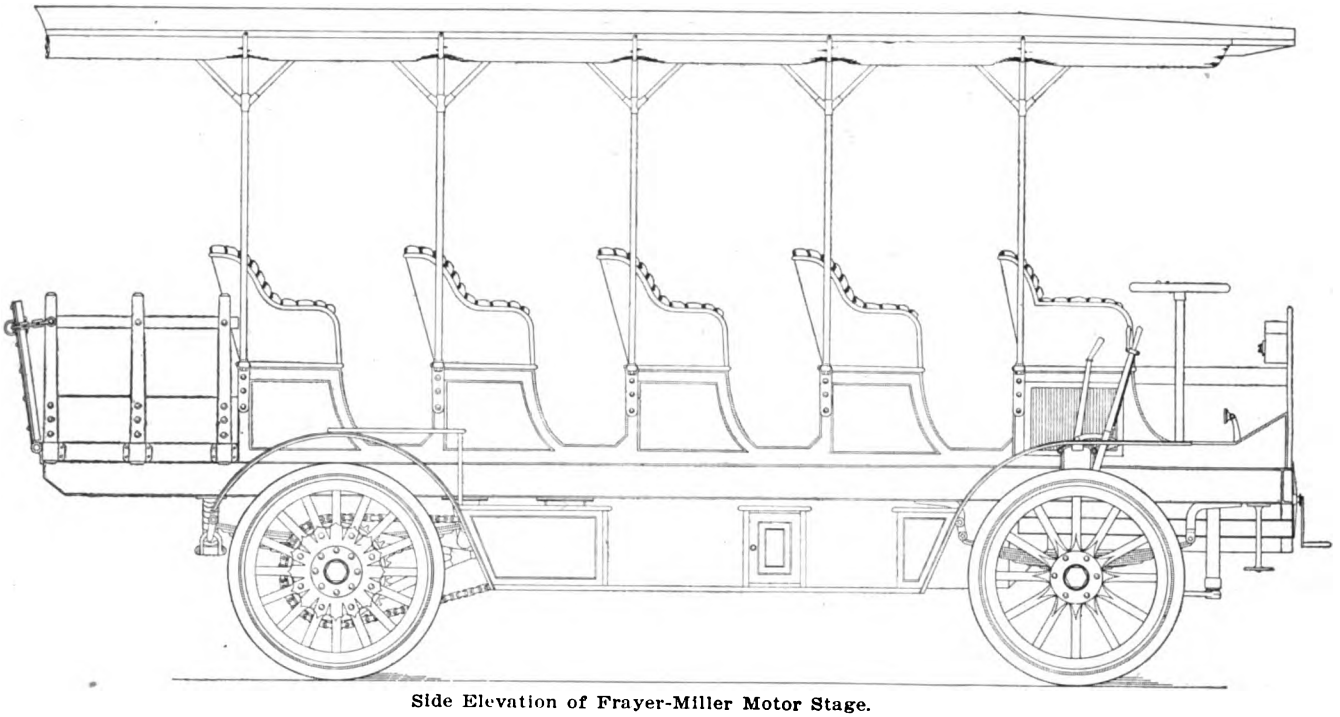


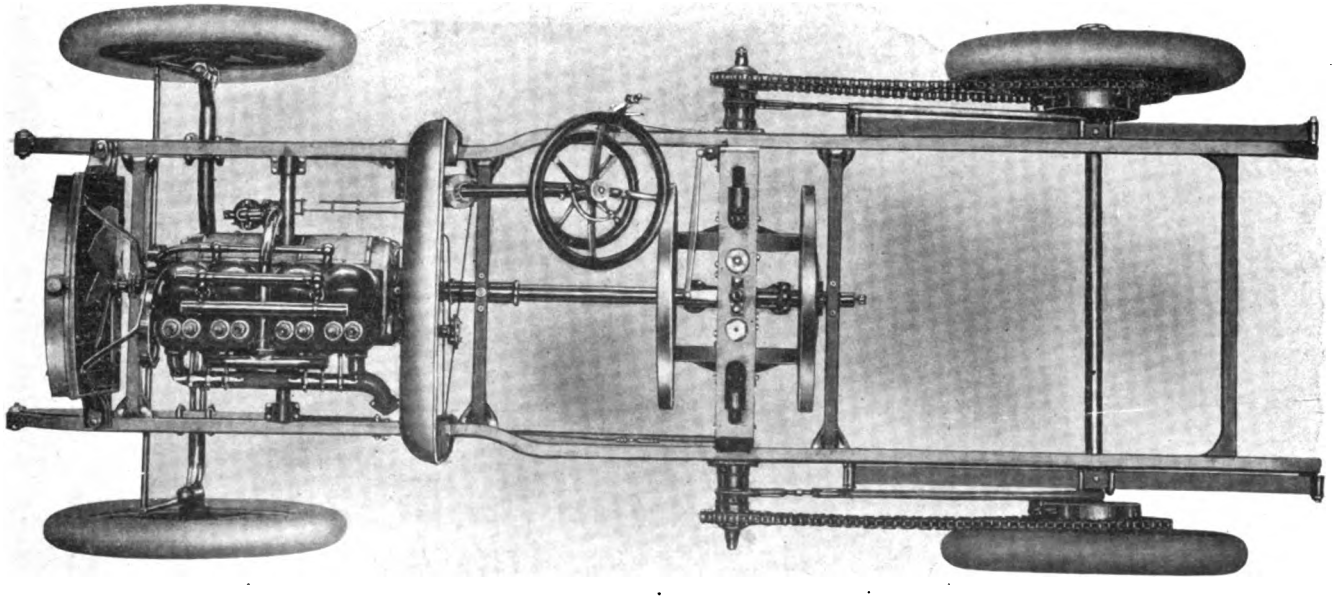
Side Elevation of Frayer-Miller Motor Stage.

various electric models including victorias, stanhopes, station wagons, coupes, open and closed delivery wagons, and a three-ton truck.

FRAYER-MILLER MOTOR BUS.—An order for 15 motor buses with carrying capacity for 20 passengers has been secured by the Oscar Lear Automobile Company, Columbus, Ohio, through its San Francisco agent. The first of these vehicles is now being constructed and will be ready for shipment within the course of a few days. The machines will be equipped with a 50 hp. engine and four-speed transmission. The drive is by side chain from jack-shaft. The wheel base is 130 inches and the tread 66 inches. The paying load, including 50 pounds of baggage for each passenger, is figured at 3,400 pounds. The wheels are 30 inches in diameter, 4 inches in front and 5 inches in rear. These machines will ply between Pieta and Highland Springs, California, and are intended to climb a mountain grade 9 miles in length, with other grades of 6 and 8 per cent to be encountered on the route. The motor is air-cooled. It is the peculiarity of the Frayer-Miller motor that the cooling factor is in exact proportion to the heating factor. The design of the chassis of the 20-passenger bus will, with a few slight modifications, be available for the construction of motor trucks.

SALES OF RAPID WAGONS.—The Rapid Motor Vehicle Co., of Pontiac, Mich., have recently made shipments of their wagons to the following concerns: Bacalo Mfg. Co. and Rea Witzig, Buffalo; United States Express Co., A. Asen, and Society of Lying-in Hospital, New York; Calgary Garage Co., Calgary, Can.; Henry E. Ackley, Hempstead, Long Island; Art Stove Co., Detroit; J. P. Lewis & Co., Brockton, Mass., and Van Ness Garage, Burlington, Vt. The Rapid company's business is expanding so quickly that the erection of three new buildings has become necessary. One of these is to be a two-story brick building for the manufacture of bodies only. The others are a large testing house and a dry kiln.

HOLROYD JOINS MIDGLEY.—Alec Holroyd, who for thirteen years has been identified



Chassis Fitted with Evansville Automobile Company's Transmission.

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with the Hartford Rubber Works Co., has followed Thomas Midgley, its former president, to Columbus, Ohio. He has been elected vice-president of the Midgley Mfg. Co., of which Mr. Midgley himself has reassumed the presidency.

RUBBER COMPANY'S BIG TRUCK.—For some time past Morgan & Wright, the Detroit tire makers, have been operating a five-ton electric truck in hauling incoming and outgoing freight shipments. It has replaced two two-horse trucks and is decidedly economical. "Juice" costs about one dollar a day. Batteries are charged at night; but if extra hard service is demanded of the vehicle it is given an "electric lunch" about noon. Morgan & Wright estimate that the cost of operating this electric truck is about one-third less than the cost of operating horse-drawn trucks transporting equal loads.

ATLAS SPRINKLING WAGONS.—Seven Atlas chassis were ordered last month by the American Car Sprinkling Company, of Worcester, through Fred Adams, Boston agent of the Knox Motor Truck Company. They will have tanks mounted on them and be used as street sprinkling wagons.

IN GOVERNMENT USE.—Another 24-horse power Atlas truck with a capacity for three tons has been shipped to the United States armory in Benicia, Cal., making the third truck that has been purchased by the Government for that particular post in a year.

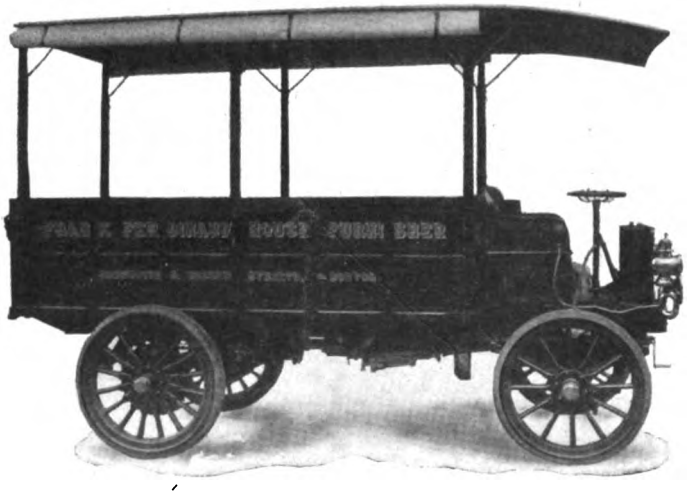
Morgan & Wright's Five-Ton Electric Truck.

TEN-TON TRUCK TO HAUL BRICKS.—A ten-ton steam truck, with 35-hp., manufactured by the Pittsburg Machine Tool Company, of Allegheny, Pa., has been purchased by A. Hamburger & Sons, of Los Angeles, Cal., which concern has some of its capital invested in a brick-making plant.

INCREASE IN CAPITAL STOCK.—The Diamond Rubber Company, of Akron, will still further increase its capitalization. Recently the capital was increased from $3,500,000 to $4,000,000. At the April meeting of the company it was decided to make the capital $5,000,000.

The Frayer-Miller Truck

POSITIVELY COOLED BY AIR



4 cylinder air-cooled motor. The Frayer-Miller system of cooling.
4 speeds ahead and reverse. Large wheels and tires.
Bodies and tops to order.

Oscar Lear Automobile Co., COLUMBUS OHIO

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 31 JUNE, 1907 No. 31

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WALTER WARDROP, EDITOR

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Industrial Vehicle Show

National Association of Automobile Manufactures to Conduct One in Chicago Next Fall

IMPRESSED with the rapid development of the industrial motor vehicle industry, and recognizing the absurdity of longer exhibiting machines intended for pleasure and commerce under one roof, the National Association of Automobile Manufacturers has wisely decided to hold two shows in Chicago next fall from November 30 to December 7, one to be reserved exclusively for commercial vehicles, their component parts and equipment, and the other, as heretofore, for pleasure cars.

The industrial vehicle show will be held in the Seventh Regiment Armory, formerly known as Tattersall's building, in which there is an unobstructed floor space 113 feet wide by 272 feet deep.

* * *

Now that the decision to separate business vehicles from touring cars upon occasions when exhibitions command public attention has been reached by one of the controlling trade bodies, everyone is enabled to perceive that it was an error in judgment to have ever permitted their combination. The presence of a few trucks and light wagons at pleasure car shows could only have the effect of minimizing the importance of the economic idea in transportation which they so inadequately represented. They were unnoticed by the majority of visitors, and sneered at by the small fry of the trade who despise the humble drudgery of their work, and hold their sale in contempt. At the only national exhibition of recent times where an earnest attempt was made to equalize the opportunities for exploiting the uses of both classes of vehicles, it was very noticeable that the business transacted at the commercial vehicle booths was of an unusually brisk and profitable character. Commercial results were beyond expectations. Such as had salable machines were beseiged for information concerning their economies in performance, cost, carrying capacity, and other matters of general interest to purchasers. At the show held in the Grand Central Palace in New York, where a dozen or so industrial vehicles were modestly grouped, it was clearly demonstrated that if a more catholic representation of manufacture had been encouraged and secured greater gains would have resulted. Limited space, however, and the necessity for first serving the wants of touring car makers, interfered with the accomplishment of a project which was well conceived but badly carried out.

* * *

It has often occurred to the imaginative to speculate upon the effect which an exclusive motor vehicle show would exert upon the makers and users of pleasure cars. That it will be forceful and of permanent advantage can hardly be doubted. The function of the business machine being to establish economy in transportation, it will naturally follow that all who come in contact with its various manifestations must, whether they own pleasure cars or not, become acquainted with the close relationship existing between mileage, speed, load and cost of upkeep and the necessity for keeping them within control. The nice judgment shown in the proper selection of motor wagons for a given service will hardly be lost upon those who operate pleasure cars which are more highly powered, more capacious and heavier than the average of daily use requires. Every commercial house makes a practice of knowing what it costs to operate its motor wagons, or at least earnestly desires to be so informed. The habit will be acquired by owners of pleasure cars once they understand how desirable it is to be able to control the factors which cause waste. As the necessity for ultra-fashionable

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appearance does not hamper motor wagon design, constructors have all the liberty they could wish to make parts accessible which are subject to occasionable derangement. There efforts in this direction cannot fail to be of service to their brother engineers who are at their wits ends to make touring car mechanism more accessible. Many other thoughts will readily suggest themselves to prove wherein the development and employment of the industrial motor vehicle will be advantageous to the designers and users of pleasure cars. But none will exceed in importance the rule laid down by motor wagon economists, that to get the most efficient service from any vehicle the utmost care in inspection, repair and maintenance is demanded. And in no situation can so much emphasis be given to the value of this practice than in an exhibition which bares all of the resources which are employed in order to achieve economy.

* * *

Today the motor wagon industry is largely the debtor of the pleasure car industry. The mechanical achievements of the latter have been adapted to further use by the former. But as the ecenomy of the business vehicle becomes more widely known through service this obligation will be discharged, principal and interest, and debtor and creditor will change places. Utility and economy will in that day furnish the sole reasons for owning automobiles, whatever their nature or employment. It is the good fortune of commercial motor vehicle makers to be in position to encourage and diffuse right thought and right use of automobiles as a substitute for the hysteria and extravagance which is so prevalent in the automobile world at large. But the money saving machine must be kept apart from the money spending machine until such time as the contrast between their performances is robbed of its power to react to the disadvanatge of the business vehicle. Probably many will conclude that the divorce just decreed should be made permanent and not temporary.

* * *

It is the intention of the N. A. A. M. management to earn permanence for industrial motor vehicle exhibitions by methods which are well calculated to appeal to sound business sense. Visitors at the concurrent exhibition where touring cars are to be shown will have access, without extra charge, to the building in which motor wagons are shown, and while but a small percentage of their interest can be immediately cashed for the benefit of the industrial motor vehicle industry, nevertheless, their opinions concerning it will be so much improved and broadened as to be of indirect value. To what extent retardation of the movement to accomplish reform in minor transportation is ascribable to a public ignorant of industrial motor vehicle economies would be hard to say, but it is undeniably true that its progress is considerably hindered by confining knowledge of the superiority of motor road transportation to manufacturers who make the vehicles and a few thousand concerns who make use of them. The bulk of draft animal users are amazingly ignorant of the economy of the motor wagon despite the fact that instances where it is found uneconomical are rare. The education of the masses, therefore, is a first function of an exclusive industrial motor vehicle show.

* * *

It is furthermore of great importance that some more effective method of conducting sales be developed than now prevails. To this end it is necessary that the attention of automobile agents throughout the country be forcefully drawn to the uses and superior advantages of the business machine. Up to date they have been indifferent to either one or the other, being of the opinion that the profits derivable from occasional sales would not reward the energy spent in making them. The fallaciousness of this theory is evident to all who have closely followed the efforts of agents who have specialized the sale of motor wagons and vehicles for commercial purposes. For a long time the pleasure car industry lacked the powerful aid which only a highly organized retail selling system could lend to it. The number of agents was disproportionate to the volume of business transacted. Now they are a host and in their number protect and insure the permanency of the industry of which they are so important a part. The only thing needed in order to fortify them in their present position is to supply them with a vehicle which can be sold as well one month as another and which is not likely to become unsalable because it lacks some contrivance more fashionable than useful.

All this is said well understanding that automobile agents at large are not itching to handle industrial motor vehicles. It is observable, however, that the success which a few of their brethren have met with in specializing this branch of trade has aroused many to make inquiry concerning the possibility of their becoming similarly active. While at the present moment it requires skill and much patience to sell motor wagons—and these are two qualities with which the majority of agents are not very bountifully endowed—the time is not far distant when so many business machines will be in use that sales will be made with considerable ease and automobile dealers will be recognized as the logical distributors of industrial motor vehicles among consumers. When that time arrives those agents who meanwhile have informed themselves concerning the use and economy of commercial motor vehicles will have an advantage over their competitors.

* * *

It is difficult to follow, and impossible to agree with, the logic of agents who affect to believe that it is a waste of time to endeavor to sell motor wagons. The period during which they sell pleasure cars is so brief that were it not for the garaging and repair business which they conduct the bottom would quickly fall out of their enterprise. Indeed, as matters stand with the majority, the profits accruing from their labors are none too large. Every time they make a sale of a car they exert one hundred per cent sale energy. To prevent a customer, who for some reason or other may be dissatisfied with his machine, from purchasing another model, it is necessary again to exert one hundred per cent sale energy. Always and forever there is a repetition of this high pressure work. Pleasure

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car buyers are ever on the lookout for novelty; in fact they prefer novelty to reliability. A different order of things prevails in the commercial world. When an establishment with merchandize to transport buys one wagon from an agent, and the vehicle gives satisfaction in service, he is heir to all future orders of the concern without a repetition of the toilsome work by which the first order was secured. In short, the value of repeat orders to an agent who sells commercial wagons can be, and often is, of vastly more importance than the sale of many touring cars, the procuration of which in the gross has taken more time and been more expensive than the sale of the commercial vehicles. An agent who is successful in selling motor wagons, therefore, can count upon future profits resulting from past work, since no investor in motor wagons wants his installation to be of a heterogeneous character.

* * *

Another function of an exclusive industrial motor vehicle exhibition will be to develop harmony of purpose and thought upon all matters vital for the success of the business. It is too common nowadays to find manufacturers entertaining widely different views concerning the common problems in mechanical road transportation. The makers of light delivery wagons know nothing of the difficulties encountered by those who produce heavy wagons, while heavy wagon makers consider light vehicle makers as practically immune from trouble. The specialization of production seems to be held as excuse for not being informed concerning matters about which the public is rightfully curious to know. It should be within the duty of every industrial motor vehicle manufacturer to discuss as an expert the economies to be derived from the employment of motor vehicles of every kind. Doubtless some steps will be taken during the progress of the first industrial motor vehicle exhibition to make this information available to all who may be in need of it, and formulate opinions which will be regarded as authentic upon all subjects relating to the economic employment of commercial automobiles.

* * *

Aside from giving visitors and agents free access to the exclusive industrial motor vehicle exhibition, the management of the N. A. A. M. proposes to issue special invitations to the operatives of transportation departments connected with large mercantile establishments. The principals of such establishments will also be encouraged to take advantage of the opportunities to see how extensive and various is the industry thus exposed. All who have heavy investments in horses—cab companies, express companies, liverymen, transfer companies, municipal department heads, army and postal executives, telephone service administrators, etc.—will be dilligently recruited, as much for their own benefit as for that of the industry which for policy sake they must encourage.

By the time the public of a great city like Chicago is made acquainted with all that has been done, and is being done, by industrial motor vehicle manufacturers much ignorance, predudice and doubt will have been cleared away, and much enlightenment put in its place.

MOTOR MAIL WAGON CATCHES FIRE

THROUGH the carelessness of an operator one of the steam motor cars employed in the Milwaukee mail collection service was recently damaged by fire. The machine was not properly inspected and a leaky fuel pipe permitted gasoline to flow, the vapor being ignited by the burner. Fearing an explosion, the driver opened the valve and let out all the of the gasoline, which added to the seriousness of the blaze. The body of the vehicle was scorched, but no mail was destroyed. This is the second accident due to carelessness on the part of the operator of this car, a pedestrian having been run over since it was put in commission.

ECONOMY OF MOTOR FIRE VEHICLES

IMPRESSED with the superior economy and usefulness of motor fire vehicles, the chief of the Joliet, Ill., fire department states:

"One of the most important items of expense in maintaining a fire department is ascribable to the purchase and keep of horses. Many cities are now using automobile apparatus, and I am informed that they are proving very satisfactory. I would recommend that the city of Joliet, when it finds it necessary to make additional purchases of fire department vehicles, install at least one or two motor driven vehicles with a view to finally dispensing with horses, or at least a part of them."

MOTOR CARS AT THE JAMESTOWN EXPOSITION

AT the Jamestown exposition the postal department has established a model mail delivery. Motor wagons are employed to carry mail between Norfolk and the exposition postoffices. Three machines are in service, each having a capacity for 60 mail sacks. Five round trips are made daily in addition to five side trips to the Pine Beach office.

A number of officials and other employes of the postoffice department will be detailed for duty at the Jamestown exposition, and the postmaster general will issue instructions to such to inspect and report as to the merits of the various makes of automobiles there exhibited, particularly as to their adaptability for postal collection and delivery purposes.

It is also understood that General Grant will detail officers from his command to inspect the automobiles on show at the exposition with a view to adopting automobiles for military purposes.

MOTOR MEAT TRUCKS AT JAMESTOWN

MEAT is being delivered to all parts of the Jamestown exposition by two electric trucks owned by Schwarzchild & Sulzberger, the Chicago packers. The machines were built for the company's local branch, which is the only meat establishment within the exposition grounds. Several gasoline motor boats will also perform delivery service on the water routes around the exposition territory.

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Foolish Advice

Horse Wagon Builders Urged to Buy Assembled Chassis and Become Motor Wagon Constructors

THE last issue of the "Carriage Monthly" urges carriage and wagon builders, without distinction as to qualification or factory capacity, to become automobile and power wagon producers and rely for their chief assistance upon concerns which make a specialty of the sale of complete chassis. Fortunately for the public and the industry the advice cannot and will not be heeded, and for some time to come the manufacture of automobiles for pleasure and commerce will be slowly developed by those who specialize their production and a few conspicuously successful carriage and wagon making concerns which have the temper, talent and equipment necessary for building motor vehicles.

* * *

If the wish of the "Carriage Monthly" could be fulfilled every cross-roads maker in the country would be producing power wagons, heedless of what became of them after installation in service. We read:

The fact that reliable concerns are now engaged in the production of chassis ready for bodies is of vast importance to the vehicle industry. It means something to every vehicle builder who has the enterprise to make it mean something. The automobile builders, who have heretofore monopolized production, will not be able to do so any longer The market is open to any builder who desires to enter. The chassis has become, in a sense, only an accessory, but a very important one. It can be purchased just as wheels or bodies. With this advantage, the carriage builder or the wagon builder of small capital can add to his business with but little outlay. He has the same opportunity as the larger builder, and can, by studying the wants of the trade, pick up orders. With such an adjunct to business there would be no dull months.

It is said there are over four thousand wagon builders in the United States. It is within the reach of every one of them to become an automobile builder, especially a builder of commercial trucks. If their margins on wagons are light, there is room to increase them by building commercial trucks, for which there is need in every community. But little additional equipment is required in shops for their construction. There is no excuse for any wagon builder in the United States not entering into the business and succeeding. All who have entered have succeeded, have all they can do, and have a widening and inviting field before them. The suggestion may surprise many wagon builders who have never manifested any ambition to get out of ruts, but the chance is there. Chassis of any kind, size and capacity can be purchased, complete and guaranteed to do a given amount of work.

* * *

For seven years past carriage and wagon makers have been urged by well informed manufacturing economists to set aside a portion of their plant and capital for the production of motor vehicles for pleasure and business. The appeal, however, has always been made to those who it was understood would be likely to be of credit to the industry. It was based upon two assumptions: one, that the automobile will in a comparatively short time supersede the horse-drawn vehicle; the other, that the carriage maker's business acquaintance and his training fit him to engage in the substitution of one for the other, and thereby protect his present investment.

As nothing of a revolutionary nature has taken place in the carriage and wagon trade within the memory of man, it is almost too much to expect that the bulk of its members can look far enough ahead to recognize the imminence of the prospective substitution. With a few notable exceptions, the great majority of carriage and wagon builders reject entirely the evidence and experience of the last seven years touching the progress of the power wagon and its economies. Of recent years the manufacture and sale of horse-drawn vehicles has been brisk. This fortunate state of affairs is ascribed by the vanity of those interested to the permanence of an old trade rather than the pervasive prosperity of a period which witnesses an extraordinary demand for productions of all kinds.

The questions currently asked by carriage and wagon builders who have just reached the point of "considering" automobile manufacture are the same old ones that were disposed of by their more enlightened competitors six or seven years ago. Now, as then, we listen to the same old doubts and the same old threadbare predictions. We observe the same old selection of a single failure as evidence for the rejection of a thousand successes. These are all signs of restricted vision which end in temporizing with a situation until it becomes impossible.

* * *

The "Carriage Monthly" emphasizes the availability of complete chassis. As a matter of fact, excepting some expensive imported chassis of special interest only to the customers of a few coach builders, the sources of supply for complete chassis on a commercial basis, either for gasoline or electric vehicles, is extremely limited and practically preempted. With a few brilliant exceptions, the carriage and wagon makers, whatever their training and factory equipment, prefer to limit their participation in automobile manufacture to the construction of the body, and in doing so follow the rule of human vanity in assuming that its production is of the most importance, and that the running gear and motor are mere trifles to be bought and treated as they buy step-irons and other carriage hardware. This may be well enough so far as it applies to gasoline vehicle chassis, inasmuch as the plant and mental capacity required for producing gasoline vehicles is wholly different from that which the average carriage and wagon maker has available. But this type of chassis can only be interesting for those concerns in which body construction occupies the chief attention. At least this is the case so far as touring car manufacture by carriage making plants is concerned.

* * *

The advent of the power wagon, either gasoline or electric, would seem to give horse wagon makers a chance to perpetuate their investments. But the unruffled conditions which for centuries have pervaded the "engineering" of horse wagon manufacture, have so concentrated

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the minds of the participants upon trifles that broad differences are rarely perceptible. The lenses of their mental vision seem to be so thorougtly distorted by the contemplation of pebbles that mountains are invisible. The change in the curve of a body, a one-eighth-inch increase in the width of a step-iron, a heart-shaped hinge strap instead of a square one, are matters which are elevated to the plane of revolution in carriage and wagon engineering; and the superlative of thought having been applied to the minimum of differences, there is only commonplace thought left for the consideration of what is important.

* * *

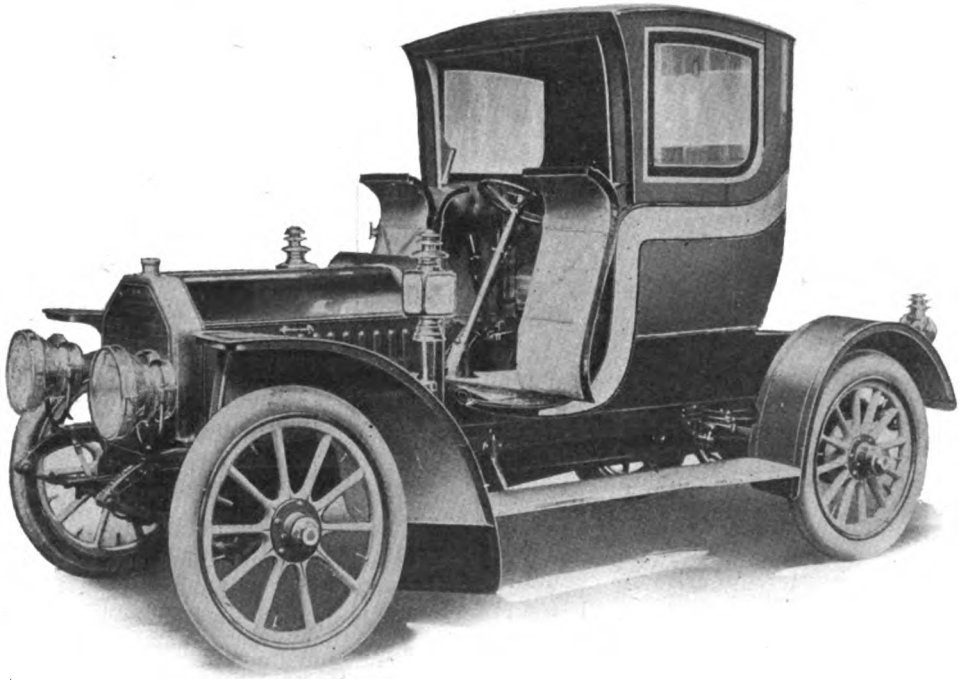
The problem, like most problems involving change of view, is a physiological one. And in order that the advice of the "Carriage Monthly" shall not be wasted, and that the investment of carriage and wagon makers shall not disappear with the general use of the horse, their first and most important duty is to change their point of view. So long, however, as they persist in believing that the chassis of an automobile is simply an accessory and purchasable as wheels, tires, bodies or other equipment, it is unlikely that they will make much headway. In urging its clients to sieze a share of this "monopolized production" the "Carriage Monthly" displays unfamiliarity with the situation which keeps the bulk of carriage and wagon makers satisfied with their present lot. It is the simple, positive, unbending, dull and peasant-like declination to see or do anything with which they are not familiar that sounds the death knell of the horse vehicle builder coincidently with the supersession of the horse for ordinary use.

CONCESSION FOR HEAVY MOTOR TRUCKS

FOR some years past the owners of 5-ton motor trucks have been compelled to pay $4 every time it became necessary to cross the Hudson on a Pennsylvania railroad ferryboat from Twenty-third or Cortlandt street to Jersey City, notwithstanding other ferry lines only charged 90 cents for the same service and 80 cents for loaded horse-drawn vehicles.

Thanks to the activity of the American Motor Car Manufacturers' Association the charge for ferrying a motor truck across the river on the Pennsylvania boats is now 35 cents, while if tickets for transportation are bought by the hundred the charge only amounts to 30 cents. This tariff, howover, does not apply to trucks loaded with heavy machinery, for which a higher charge is made.

In Germany the postal and war office motor wagons use alcohol as fuel, the liquid containing 10 per cent of water and about 2½ per cent of benzol. It is impossible at a distance of three yards behind one of these cars to distinguish the slightest smell.



Motor Cab With Inside Steering Control

ALL motor cab companies find it necessary to keep vehicles for private hire as well as for public use, the income from the former often providing a large revenue through weekly, monthly or season rental. The cab illustrated above is made by the Peerless Motor Car Company, of Cleveland, and is distinguished from others of its type by the clever manner in which steering is controlled from within the body. This feature is now in this country, although it has been witnessed abroad for some time past. The engine is of the four cylinder, vertical type, developing 30 hp. The wheel base is 109 inches. The length of frame over all is 149 inches. These dimensions are rather too generous for dense city traffic, but as the vehicle is designed for semi-public use and its field of operations is in regions where there is comparative freedom for turning and manœuvring, compactness, which is the characteristic of all public service vehicles, has been sacrificed for distinction. The mechanical features of the cab do not differ from those found in the companys roadster.

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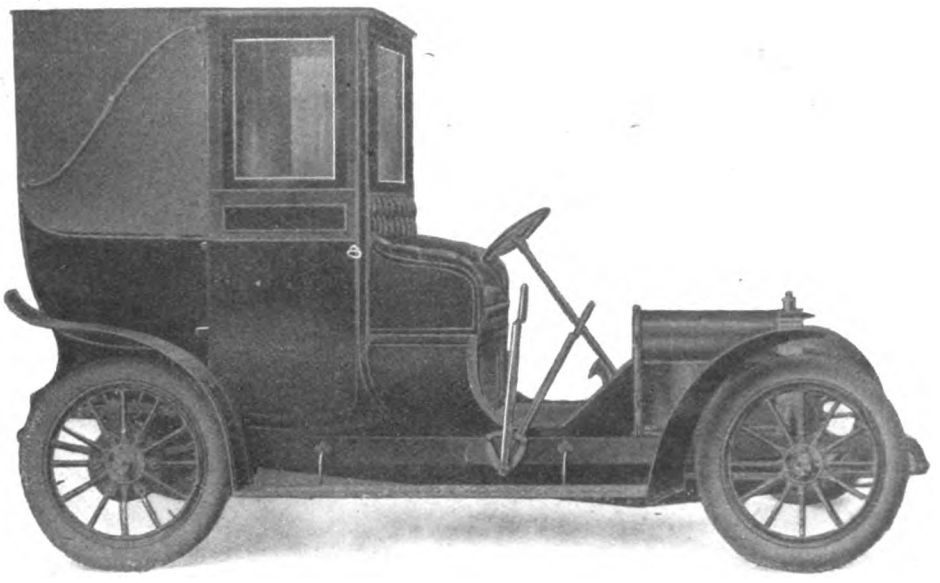

The Thomas Motor Cab.

E. R. Thomas on Motor Cabs

Prominent Buffalo Manufacturer Believes Their Construction is of Great Importance

SO much interest has been aroused in the statement that the Thomas Motor Car Company, of Buffalo, would soon undertake the production of gasoline motor cabs that the following utterances from E. R. Thomas, president of the concern, will sharpen the desire to know more concerning its commercial intentions along this line:

"Mechanical transportation as applied to individual public conveyance here has not come to be the popular institution it is in the great cities abroad, and although several schemes have been mooted whereby cities were to be supplied with gasoline cab transportation the Thomas Motor Company is the first American concern of the kind to engage in this branch of the industry on this side of the water. There is undoubtedly a great and promising field for our enterprise in every city of any prominence.

"The plans for the making and marketing of these cars have been under consideration with us for over a year. During that time Gustave Chedru, head of the foreign engineering department of the company, has been conducting investigations in Paris, the present center of the industry. Mr. Chedru was formerly chief designer and general superintendent of the De Dion, Richard-Brasier and Clement-Bayard plants. As a result of his long experience and the critical investigation he has given to the subject, it has been found possible to manufacture a car that shows a marked improvement, both in simplicity and refinement, on the commonly accepted standards for such vehicles, and which embodies the principles of lightness and strength to a degree that has not heretofore been approached.

"Our cars will show a marked advance over anything in the line placed on the market. They will have four cylinders, a capacity for six people, and will weigh but slightly in excess of 1,500 pounds. Notwithstanding this, the old and accepted ideas of construction have not been departed from to any great extent. One of the causes for this is the design, and another the high quality of materials that will be used in the construction.

"The wheels and tires of this car are larger than those ordinarily used for a car of its weight, a fact that will mean much in the item of cost of maintenance, and it is thought, as a result of experiments, that the cost of operating these motor cabs and town cars, surprising as it may seem, will be about that of a single horse and carriage. This fact will open up a field of possible purchasers which has never before been accessible to the automobile manufacturers in this country.

"We are not as yet in a position to furnish details of the construction of the new motor cabs, but a general description would show that the car has a four-cylinder, water-cooled motor, shaft drive, a three-forward speed and reverse transmission and a wheel base of 100 inches. The greatest saving in weight comes in the motor, which, because of the ultra-advanced ideas used in its construction, will not weigh approximately more than half what the present-day motors of about the same horsepower do."

In announcing its plans for the manufacture of motor cabs and town cars on a large scale the Thomas Company takes the lead in a movement in this country which is already well advanced in Europe. As soon as the plans were completed, months ago, it was found that a separate plant and special machinery would be necessary for making these vehicles. Deliveries will be made early in the fall.

The gross earnings last year of the Delaware Valley Transportation Company, which operates motor buses between Port Jervis and Milford, N. Y., were $6,367; the net earnings $1,532.

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Discarding Horses Entirely

Exclusive Reliance Upon Motor Wagons is Necessary if Gross Economy in Service is Desired

WITH the gradual passage of time it becomes very apparent to establishments which were early in making use of power wagons that there is nothing to be gained by delaying the moment when total replacement of their draft-animal transportation shall occur. At first it was the experimental demonstration of economy which was desired; now it is the gross economy which a wholesale substitution of power wagons for draft animals would afford that is coveted.

The installation of a few motor wagons in a large stable of horses very imperfectly indicates the saving which might be accomplished if all of the firm's transportation was accomplished by motive power. The difficulty of separating the horse wagon and power wagon accounts in an establishment where the stable administration is none too highly organized is sure to react to the disadvantage of the machine. Alongside of this there is the obscuration of the gains which would result if the two forms of equipment were not in interference with each other. As long as horses are maintained drivers' wages and general stable expenses must be greater where a few motor wagons are employed than if the conversion their use indicates were made complete.

* * *

The presence of a few motor wagons in a stable full of horses does not eliminate the high cost of draft animal transportation, nor perceptibly lessen the weekly wage account. Their employment does not materially affect established overhead expense and general administrative costs. It is equally apparent that in such establishments the use of a few machines does not reduce rent or justify the stable being located upon less expensive ground or in a vicinity calculated to be more advantageous for the performance of work. The stabling of horses and motor wagons in the same building is penalized by the necessity of so locating the stable as to accommodate the infirmities of the animals. Manifestly, therefore, the machine is often disadvantageously situated.

* * *

The desire to effect a reform is, unhappily, not always attended by an ability to put it into execution. The replacement of fixed investments is never lightly undertaken, even when the hazard is practically eliminated. The floors of a machine shop may contain many tools which are uneconomical when compared with modern tools of the same general kind. The operators of such an establishment may be aware of the inferiority of their equipment, may ardently wish to replace it with up-to-date machinery, and yet the change calls for such a heavy investment that the business is unable to afford it without cramping operations in other directions. Were it otherwise every machine shop in the country would have nothing on its floors but the latest mechanical creations. Time must be allowed, therefore, for the gradual supersession of one serviceable article for another greatly its superior. Concerns whose money is not all tied up in the operation of their business, or who can finance loans for needed improvements, naturally have the advantage in such a situation, since they can readily acquire modern equipment.

There are many such establishments using power wagons, and it is distinctly encouraging to observe how eager they are to realize the benefits to be derived from the employment of a large number of the machines. Experience indicates to them that if their transportation is wholly performed by power wagons a saving all along the line will be effected. Relying exclusively upon mechanical transport to move merchandise, the administration of necessity becomes highly organized, and road and stable troubles, which, when only a few machines are employed, are much magnified, become fewer and less conspicuous as the operating system becomes more highly developed. Both operating and fixed expenses of every kind are reduced in proportion as the number of machines employed mounts. The service, too, shows a corresponding improvement, the result of increased all-around expertness.

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Whenever power wagons have been employed in public service there has been a marked tendency from the beginning to make use of them in large numbers, once the vehicles proved their worth in experimental demonstration. The attitude of public service executives has been that the retention of horses as agents in transport is a waste of public money. Such is the view of the postal department in every country in the world. Four years ago the executives of the French postal department made up their minds to test the merits of the motor wagon on a scale sufficiently large to demonstrate the maximum economy of the machines. Thirty electric vehicles were purchased and put in operation in Paris. In the time which has intervened since these machines were commissioned sufficient evidence has been accumulated to establish the wisdom of the experiment, for such it was, seeing that at that time industrial motor road vehicles of any kind were few and far between in the French capitol, or for that matter in France. The employment of these wagons suggested other and broader use for motor vehicles, and eventually has led to a decision to dispense with draft animals in the Paris mail service. This ambitious program will be carried into execution in October, 1908.

* * *

In reorganizing its Paris collection and delivery service the French postal department proposes to conduct a series of tests which will demonstrate the respective merits of electric, steam and gasoline machines. This does not imply that the electric wagons now in use will be discarded. The service they have afforded for the past three years has been too satisfactory to expect that they will be re-

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tired even to make room for more modern vehicles. They still possess a high asset value. Their carrying capacity and range, however, unfits them for service in which loads are large and journeys are lengthy. There are large loads to be transported from railroad depots to the main office and from thence to outlying stations. For this work 79 relatively fast and high load machines are required. In order to ascertain what type of vehicle will best perform this service the government has decided to let manufacturers or contractors for the city mail transportation, demonstrate three kinds of vehicles, each with different load rating, and will guarantee to the successful competitor a monopoly of governmental service for a period of nine years. The first of these tests began the middle of last month. Competitors were required to post a forfeit of $2,000 as a guarantee of square dealing and $20,000 as a guarantee that machines of the type entered are capable of continuous duty. The competition will be conducted in actual mail service. Payment for the work performed by the machines will be made on the basis of the distance covered, drivers and supplies being furnished by competitors, the wages of one and the cost of the other being covered in the mileage charge.

The three classes to be demonstrated are as follows:

Type A (39 vehicles for ordinary service and 4 for extraordinary or reserve service). Each of these vehicles to cover in normal service 650,000 miles annually and have a carrying capacity of 1,750 pounds.

Type B (10 vehicles for ordinary service and 2 for extraordinary or reserve service). Each of these vehicles to cover 162,500 miles and have a carrying capacity of 2,500 pounds.

Type C (24 vehicles for ordinary service and 4 for extraordinary or reserve service). Each of these vehicles to cover 375,000 miles annually and have a carrying capacity of 4,000 pounds.

The speed of none of these vehicles must be less than 11 miles an hour.

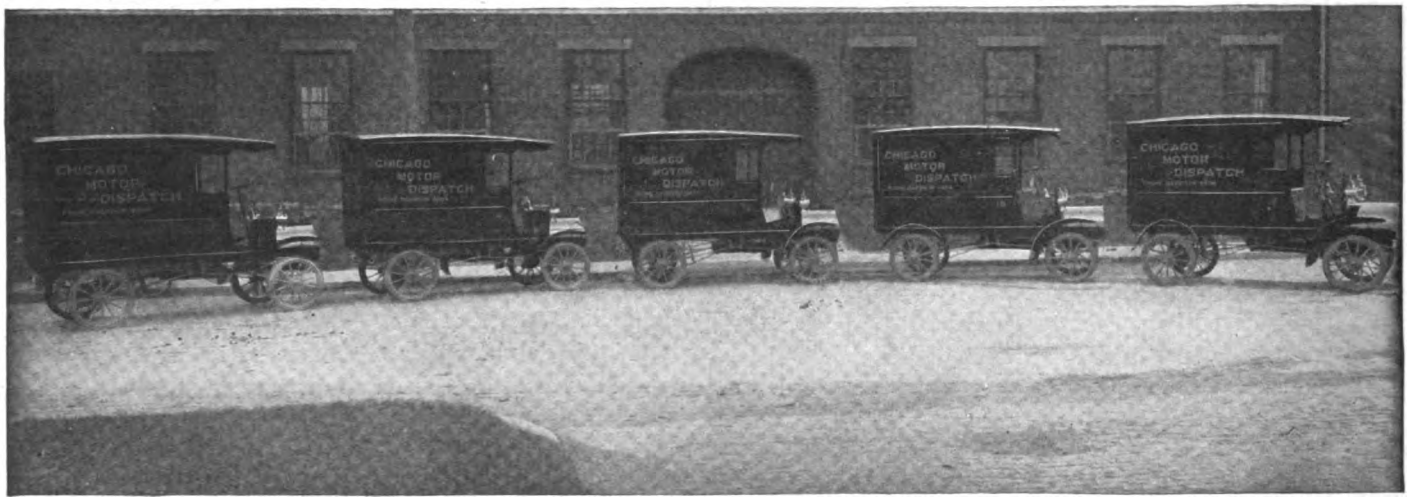
MORE INTER-CITY MOTOR TRUCKING

FOR many years a considerable volume of merchandize has been transported by horses between Kansas City and Independence. The formation of the Kansas City Independence Automobile Transfer Company, however, which will conduct a motor freight and transfer business, will afford much faster and better service between the two cities.

Headquarters of the company will be in Independence. The principal stockholder in the new enterprise controls most of the horse freight traffic passing between the points named. Two machines will be operated at the outset. More will be purchased as the business develops. Each machine will make four round trips daily.

An electric bus makes two round trips daily between Almont and Romeo, Mich., which towns are nine miles apart.

The chief of the fire department in New Orleans has recommended the purchase of a gasoline motor chemical wagon, to cost $3,800.



Motor Package Delivery

THIS illustration shows the exterior of the Chicago Motor Despatch Company's Garage and some of the Logan gasoline wagons employed by the concern. A description of the service performed by this company was prese ted in the April number of the "POWER WAGON." The wagons are rated to carry 1500 pounds and are fitted with 10 hp. air cooled engines. They are used to collect packages from retail merchants within the down-town loop district and deliver them to customers in the city and suburbs, a charge of 10 cents being made for parcels weighing under 10 pounds delivered within a short radius and a charge of 20 cents for heavier packages delivered a greater distance. Similiar motor package delivery service has recently been organized in St. Louis. Boston and Baltimore are the next two cities on the list for like service.

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Street Pavements

Lower New York Being Paved With Wood Blocks Which are Well Suited for Motor Traffic

IN the lower part of New York the noisy granite street surfaces are gradually being replaced by creosoted wood blocks which are not inaptly termed "the silent pavement." The docks and ferries of Manhattan surround the office district on three sides, and the trucking of this great seaport passes up town through the heart of the business district; hence it is imperative that such traffic should be conducted with as little noise as possible.

Until recent years granite was the only pavement known which could withstand the weight of heavy traffic. The frightful uproar which this rough stone-produced, however, caused it to be looked upon as a menace to public health. Relief is sought by the introduction of the wood block pavement which, in addition to its silence under heavy traffic, is durable and affords good footing.

It is not the ordinary creosoted wood block with which lower New York is being paved. The wood used is treated to the heart with 22 pounds of preservative mixture to the cubic foot, instead of 10 or 12 pounds as is the general practice. The wood is heart long leaf pine. The waterproofing mixture employed to treat the blocks, unlike plain creosote oil, excludes all water, prevents the blocks from swelling and their surface from becoming soft and spongy. When treated with the preservative mixture and waterproofed, the blocks resist wear in the most surprising manner and become absolutely sanitary on account of the fact that street filth cannot be absorbed, as well as because the preservative mixture itself is a powerful germicide.

Pavement laid with these blocks is durable, smooth, noiseless, sanitary, easily cleaned, easily removed for repairs, and not in the least slippery. It is durable because, unlike any other pavement known, it does not crumble, pulverize or wear away by constant traffic, but simply compresses, becoming more and more solid with the increase of traffic. Its serviceable life is greater than that of stone pavement. There are no joints in the pavement, the entire surface being welded into one smooth and even mass. This makes it easy to clean and insures proper sanitary conditions. On level stretches and light grades it is

Fine Example of Waterproof Wood Paving

THIS illustration affords a fine example of modern wood paving on a downtown street in New York City, which is subjected to much heavy traffic. The view is in Murray street, running from Broadway to the Erie ferry. This portion of the street is laid with blocks 8 inches long, 3 inches wide and 3½ inches deep, treated with 22 pounds of creo-resinate mixture to the cubic foot, the blocks being imbedded in a cement mortar bed on a concrete foundation and the joints filled with cement grout. Although the street is on a slight grade, it is not laid with a grooved block, this not being necessary. It has proven highly satisfactory in service and, with other streets, has resulted in many petitions for the increase of this class of pavement in downtown New York. This pavement was laid in 1904.

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not slippery, the end grains of the wood affording good traction. On heavy grades a grooved block is laid, the grooves running transversely on the street one-quarter inch wide and one inch deep every three inches.

Practically all of the wood pavements which have been laid of recent years in the United States have been of long leaf pine blocks. The increase in the price of this wood is beginning to limit its use for this purpose and investigations are under way to determine what other woods can be used as substitutes. Thus far only black gum is considered available, it being abundant and tough. In any determination as to the value of a wood for paving purposes, if we start with the assumption that by filling the pores of the wood throughout the block completely with a good quality of creosote oil, decay can be prevented, there remains only one other question to be decided, and that is whether the wood is sufficiently dense, tough and hard to successfully resist heavy travel. Such a determination is not a very difficult matter. In fact, it is almost self-evident that using Georgia pine as a standard, any block which is as hard or harder than this wood should give equally as good or better results, while those blocks which are not so hard—such, for instance, as short leaf, loblolly and Norway pine should give less satisfactory results. All these woods can be used for paving purposes if properly treated, but should be used with discrimination. A street laid with loblolly pine under moderate travel might readily give a serviceable life of twenty years or more, while a similar pavement under the excessively heavy travel found on such streets as exist in the lower part of New York City, would probably be destroyed very quickly.

The length of life of a wood block pavement is not directly proportional to the travel. Take, for instance, two streets laid with the same wood in the same manner. If the travel on one street approaches but does not reach the limit of durability of the wood, the pavement will last almost indefinitely, because the character of the traffic is not sufficiently heavy to destroy it; but if the traffic in its character as well as amount passes the limit of durability of the wood employed, the pavement will be destroyed in a comparatively short time. It would seem that for each class of timber there is a condition of traffic beyond which it should not be subjected, but no determination of these limits could correctly be made except from a great number of actual service tests. In a general way, however, satisfactory results may be obtained by dividing the streets into three classes: heavy, medium and light travel. On the third class of streets practically any wood which would not decay would give an indefinite life. On the second class discrimination should be used, although woods as

Wood Pavement on Twentieth Street in New York

THIS important street, between Broadway and Fifth avenue, was laid with creo-resinate wood blocks in the spring of 1904. The blocks are 4 inches deep. They were laid directly upon an old concrete foundation in the street, same being trued up by the addition of the cement mortar bed. For nine years previous to the repaving of this street it was laid with an untreated Australian wood block, which was in fairly good condition even at the end of this time. The street forming as it does a part of New York's great retail store district, is subject to heavy truck, delivery-wagon and carriage traffic.

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soft as Norway pine have given excellent results under these conditions. On the first class of streets it would probably be dangerous to lay any wood less durable and resisting than the best quality of long leaf pine.

Experience shows that streets laid with blocks, some of which are hard and some soft, will wear very badly, while the same street laid with all soft blocks would wear very well. This is due to the well-known way in which one soft block will affect its neighbors, the wear extending from the one spot like a disease.

Municipal executives want pavements which can be economically maintained; property owners want cheap pavements; users of the streets and the people at large want good pavements. Cheap pavements can never be good. There is the cheap asphalt pavement, for example, which is abhorred by team owners in warm weather, when it rains, and when it sleets. Good asphalt pavement is very costly. There is no good granite pavement, at least not in this country. For examples of good granite paving one must go to Germany, where in such cities as Hamburg large granite setts are used, cut with such extreme accuracy that the surface is perfectly flat, and the joints are so small as to be practically indistinguishable. Such pavement is almost noiseless.

The tendency of motor vehicles to skid on street surfaces which are greasy and constructed with too much camber may be checked by laying pavement which is waterproof and can be easily cleaned. If these conditions are met the camber of the street can be reduced. At a conference of road engineers and road users held during the progress of the recent British industrial motor vehicle show, a paper was read by a military engineer of distinction dealing with the design of modern motor vehicles in relation to existing roads. Extracts from this interesting paper follow:

It is evident that much may be done by the designer of motor vehicles to reduce the wear and tear of the road surfaces on which they are intended to run. At the present time this matter is of great importance, and I think it would be useful to set before you a few of the points which designers are now studying, but which, in order to render them as successful as possible, need the closest co-operation of those responsible for the design and upkeep of the roads themselves.

A designer must adapt the wheels of the vehicle so as to roll over the surfaces of the roads with as little crushing and abrading action as possible, and arrange wheels so as to spread the weight over as large an area as possible. In doing this he must consider the effect of the relative diameter of the wheel he uses, the number of wheels over which the weight must be distributed, and the methods whereby he obtains the requsite road adhesion or tractive effort.

The regulations for motor wagons and similar vehicles lay down the maximum crushing load on the road per inch of width of tire at 840 pounds. There is reason to believe that, as this regulation is now being strictly enforced, a noticeable reduction will be found in the wear and tear of the roads traversed by these vehicles. The strains on a road surface produced by a horse-drawn vehicle are of two classes—the crushing strains which for equal weights and for equal tire widths are the same as those for motor vehicles, and the other or traction strains produced by the angular impact of the iron-shod horses' feet, which is a well known cause contributing to the destruction of the surface.

Cortlandt Street in New York

THE paving of Cortlandt Street in New York, from Broadway to Pennsylvania ferry, marks a new era in the history of wood-block paving. Probably in the country at large there is not another street which is subjected to heavier or more important traffic. The blocks are 3½ inches deep, laid on concrete with a cement mortar bed and cement grout joints.

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When the vehicles are self-propelled, and the tractive effort has to be transmitted through the wheels, it becomes important to know what will be the horizontal stress or tendency of the driving wheels to move the road metal backwards, also measured in pounds per inch of surface. Now this tractive effort varies greatly. It reaches its maximum when heavily loaded vehicles are climbing gradients. Experiments have shown that this horizontal or nearly horizontal strain transmitted to the road metal cannot much exceed one-third of the crushing strain, for the simple reason that the adhesion with smooth wheels is, under ordinary circumstances, limited to one-third of the insistent weight.

Hitherto, both designers and road engineers have apparently thought the only way out of the difficulty is by increase of width, and to some extent by increase of diameter of the wheels. But, unfortunately, increasing the width of the wheel does not produce the increased surface contact that is desired. This is due to the irregularity in the surface of the road, and more especially to the extreme camber which is too frequently given, and does not allow of a very wide wheel ever coming into line contact with the road throughout its entire width. Far more commonly these very wide wheels are very heavily loaded at their inner end, and the crushing strain gradually diminishes towards their outer edge, in many cases there being practically no weight carried by the outer one or two inches of the wheel.

It is evident, therefore, that if we take a very common case of 10-inch wheels, 3 feet in diameter, which under the regulations would be allowed to carry a weight of 8,400 pounds, better results would be obtained if we can distribute our insistent weight and our hauling stresses over two wheels 3 feet in diameter and only 5 inches wide, for we must remember that as the surface of the road is to some extent elastic, the road material would have to move or be crushed to only half the extent to enable the wheel to come into full line contact with it throughout the line of 5 inches, as would be the case if the road had to accommodate itself to one 10-inch wheel carring the same weight.

From this it appears that it is most desirable that constructors of road vehicles should endeavor to distribute both weight and driving strains over as large a number of wheels as possible. This arrangement is evidently an excellent one from the point of view of the road engineer. The strains are distributed over a large number of wheels, and these can be reduced in width. But the introduction of six-wheeled vehicles has another important effect, as it will be seen that when one of the wheels of a four-wheeled vehicle passes over an obstacle, that corner of the vehicle is lifted to a much greater extent than would be the case if that wheel instead of being one of two wheels on one side of the vehicle was one of three. As a consequence, the blow given to the piece of stone or the brick, or obstacle on the road on climbing over it is reduced, and similarly the blow given to the road in descending from the obstacle is also reduced; so that both the shocks to the vehicle and to the roadway are greatly reduced. It is said this reduction of shock to both would appear to be only 50 per cent, that is, in the proportion of the three wheels to two wheels, but the reduction is really found to be greater than this.

Another point of importance to designers of road vehicles is the consideration of the steering gear. So long as the steering gear was of the old traction engine type, where the leading axle is pivoted at its center, the damage done to the road by the act of steering was practically *nil*, but since the general introduction of the Ackermann system of steering the two front wheels, being each of them attached by vertical pivots to the two ends of the front axle, it is evident that unless the vertical pivot is directly over the center of the tread of its wheel, considerable strains are brought on the road surface by the act of moving the wheels through an angle, and this is particularly the case with heavy motor wagons. With lighter vehicles also, if the steering wheels are out of adjustment, so that the axis of both wheels when the vehicle is being driven straight forward are not truly in line, one or other of the steering wheels must be always slightly slipping sideways with results disastrous to the rubber tire, but also hurtful to the road; for this side movement at high speed has the effect of stirring up an extra quantity of loose particles lying on the surface of the road, with the result that they are blown away by the great draught or air current which passes under the body of the vehicle when it is driven at any considerable speed, or even at a very low speed when meeting a head wind.

A great number of roads are made with far too great camber, and as it may be many years before this camber can be cut down to a correct figure so that the wheels can rest throughout their entire width of line in contact with the road, designers of road vehicles are still considering methods by which the tires of the two wheels instead of forming one continuous cylindrical surface may be allowed to accommodate themselves to the camber of the road. This, of course, can only be done by dividing the axle and putting springs inside and outside each wheel, but the arrangement introduces considerable complexities in design, and for this reason is not likely to have much success. The true remedy for this trouble is for road engineers to realise how important it is for their own sakes that the excessive camber should be cut down.

It is probable that road surfaces also suffer in the same way as the tires do from the irregularity of the driving power introduced by the use of the four-cycle internal combustion engine as a driving power. This is very notable with a one-cylinder car. The irregularity of the driving impulses undoubtedly produce increased wear of the tire, and in so doing must increase the disturbance of the surface of the road. This irregularity in driving, entirely dissapears in the case of electrically-driven vehicles, and almost entirely in the case of steam-driven.

STEAM BUSES WITHDRAWN FROM SERVICE

ALL of the steam motor buses have been withdrawn from service in London owing to the exceedingly high cost of up-keep. As a result the number of public service vehicles operating has been reduced by 48, the total in commission at the last consus being 898, all gasoline machines. It now remains to be seen if the Darracq-Serpollet steam vehicles, a number of which are to be put in service on London streets, will prove any more economical in operation than the British built machines which have just been discarded.

The following table shows the number of motor buses operated by the various London companies:

Vanguard Motor Bus Co.	310
London General Omnibus Co.	169
London Road Car Co.	160
London Power Omnibus Co.	63
Great Eastern Motor Omnibus Co.	50
Thomas Tilling	32
Associated Omnibus Co.	29
Star Omnibus Co.	24
Birch Bros.	15
Miscellaneous Owners	46
Total	898

As an offset to the withdrawal of the 48 steam machines 17 new gasoline buses have been commissioned during the past month.

A co-operative motor cab service has been inaugurated in Paris by a number of old-time horse-cab drivers. The society owns and operates the cabs, while the drivers share the profits equally.

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Telephone Service Vehicles

The Promptness With Which Repairs Must be Made Makes the Use of Motor Cars Necessary

FEW commercial organizations are able to derive so much benefit from the superior speed possessed by industrial motor vehicles as telephone companies, whose wires and equipment are often strung many miles from the scene of active operations. In city and in rural work this speed counts for much.

The purchasing agent of the Cumberland Telephone & Telegraph Company, with headquarters in Nashville, Tenn., describes in a most interesting manner the general nature of the service which motor vehicles render in his organization. After commenting upon the fact that the very nature of an extensive telephone business requires the most modern means of locomotion, under all conditions of weather, at all hours of the day and night in order to satisfy its patrons, he goes on to say:

"We have subscribers at Ridgetop, with an elevation of six hundred feet above Nashville, Tenn., twenty miles distant; also, Hendersonville, twenty-one miles distant; at Greenville, Tenn., twenty-two miles distant, and many other points of similar distances. You will readily see that in case of trouble it is an entire day's job for a man, horse and wagon to drive any of these distances, repair the trouble and get back before dark. If a case of trouble is reported on any of these long lines about noon, and a man is started out with a horse-drawn vehicle, it becomes necessary for him to spend the night en route at an additional expense for board bill for himself and team, including supper, lodging and breakfast. In individual cases of 'trouble' on subscribers' or toll circuits the public, educated up to the 'five second' standard requires the immediate application of a remedy. To meet this phase of the telephone business requires the use of something more expeditious than the horse-drawn vehicle.

* * *

"In the history of our company two years ago the horse-drawn vehicle, plodding its way for weary miles over the pikes, up and down hill, with one case of twenty mile 'trouble' per day to its credit, was all the public expected. Today, when a case of trouble is reported by a subscriber at Hendersonville, Ridgetop, or any of the villages lying within the twenty-five mile radius of Nashville, and the line remains in trouble over an hour and a half, the fact is promptly reported to the traffic manager that the matter is being handled very slowly. In short, without knowing how and why, the rural subscriber has become imbued with the spirit of the times, and will not brook the delays of a year ago. In an effort to keep pace with the more exacting demands the company began a series of experiments with the automobile as far back as September, 1900, with a steam car purchased for toll line inspection. As the use of a steam car required at that time an operator of great skill and varied mechanical attainments it was sold within a year, and in place of it a gasoline runabout was purchased. This proved more satisfactory, and after a while another gasoline machine was added. As the exchange area expanded the negotiation of heavy grades became a feature to be taken into account, and as the little 'one-lungs' failed to deliver the requisite power or speed the last move in the game was made by the company when it purchased last year six two-cylinder, 10 hp. vehicles. Four light cars are apportioned to four 'troublemen' for the north, south, east and west sections of town and the toll lines extending out over the turnpikes from their respective sections. One car is used by the traffic department, the chief taking his solicitors to such portion of the city as may have been assigned to each, and then using the machine for such other calls as may require his personal attention. Another is used as a local and toll line inspection car, and has traveled over most of the roads in Middle Tennessee and Kentucky.

* * *

"All of the cars are fitted with odometers and are kept in the company's private garage, which is in charge of one day man who keeps up repairs, etc., and a night man who washes, fills oil and gasoline tanks, polishes and takes odometer readings, making out each day a statement of oil and gasoline consumed by each car. These cars have been averaging from sixty to one hundred miles per day, with a consumption of about 3 1-2 gallons of gasoline, and one quart of oil. Since November, 1905, they have all averaged over one thousand miles per month, and easily accomplish the work of two horses and trouble wagons and two men, and in a great measure reduce the number of 'kicks' about time consumed in restoring service.

"The runabouts have attached to the tonneau platform a shop-made cabinet, of our own design, the upper two-thirds of which is divided into compartments carrying four complete standard common battery type telephones, with other compartments for insulators, glass knobs, double pointed tacks, protectors, hand telephones, transmitters, etc., while the lower one-third is reserved for a coil each of iron and copper wire, interior wire, a pair of pole climbers and troubleman's body tools. This box is detachable by removing four bolts from bottom. The boxes are provided with locks so that no material can be removed save by the proper driver or troubleman.

"In case of sleet or windstorm, or personal injuries to employees, each large car permits six men being hurried to the scene, or the injured quickly removed to hospital or home.

* * *

"One strong argument advanced against the installation of this auto-trouble service was that its operation by a large corporation would invite numerous damage suits. By selecting sober, competent, serious-minded men to drive the cars, this objection has vanished—not a single suit having yet been brought, nor has an accident of any kind occurred. They go just as regularly as the day dawns

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—rain, snow or shine, having been provided with chains on rear wheels, and heavy canvas covers for both men and machine.

"We have adopted a plan of paying trouble men who qualify themselves to drive and take care of motor cars $5 per month more than those who drive horse-drawn vehicles, and reserve the right to put them back on horse-drawn vehicles if they show carelessness or recklessness in the handling of motor cars. In the care and maintenance of our long distance lines, where every minute counts, the motor car is of exceptional value in getting to the break or trouble with the least amount of lost time. With a motor car we have made these distances, the round trip 40 miles, in three hours. Inspection with horse-drawn vehicles is wholly impracticable, consuming too much time.

"It is no unusual thing for our superintendent of construction to visit gangs working under his supervision at Gallatin (26 miles), Hartsville (18 miles further), Carthage (12 miles), Lebanon (17 miles), and get back into Nashville (33 miles) by supper time. This trip, on account of inadequate train service, would ordinarily require three days time.

* * *

"A comparison of the cost of operating motor vehicles in our service with the cost of operating horse-drawn vehicles follows:

Motor Cars

Average daily distance traveled	60 miles
Pay of motor car troubleman, per month	$55.00
Cost of gasoline at 12c. per gallon, 4 gallons	.48
Cost of oil at 21c. per gallon	.07
Time of man 1 day at $1.50 and night at $1.00, divided between the six machines. The day man is frequently not at work on cars, and is regularly employed in the machine shop, so all time is not properly chargeable to this account	.42

Horse Drawn Vehicles

Average daily distance traveled	20 miles
Pay of horse-drawn vehicle, troubleman, per month,	$50.00
Cost of feeding, washing, etc., per day	.50

"From the above, the following facts may be deduced: It will require three horse-drawn vehicles, costing $225 each, to accomplish the work of one machine, costing $675, freight paid. So far the account stands square. But the three men necessary to attend to the same amount of trouble with horse-drawn vehicles receive an aggregate compensation of $150 per month against $55 to the one motor car driver, and the three horses cost $1.50 per day against 97 cents per day for the motor car."

CAUSES OF SIDE SLIP

SIDE-SLIP in motor vehicles is practically confined to the driving wheels, and in nearly all cases occurs when the wheel slides on the road, either on account of the pull exerted by the engine, or on account of the retardation of the brake. Side-slips on vehicles not mechanically propelled also occur practically only when the retardation of the brake causes the wheels to slide on the road.

As long as rolling contact is maintained between the wheels and the road, side-slip does not take place. In the extreme cases of turning a sharp corner, on a slippery road at high speed, and getting sideways on a sharply inclined slippery road, side-slip may possibly occur even when true rolling contact is maintained, but in the majority of cases the side-slip is started by the loss of rolling contact and the substitution of sliding contact.

Sliding contact having been caused, it is obvious that a tire, especially a rubber tire, is free to slide in any direction, and only the accident of the forces acting on the mass of the vehicle being in the direction of its motion will keep it straight. When side-slip is once commenced the momentum of the vehicle acts at a constant increasing angle to its longitudinal axis, and the slip will continue till the momentum is absorbed.

The natural deduction from the foregoing facts is that if rolling contact could always be maintained between the wheel and the road, side-slip, except in extreme cases, would be absolutely prevented. In other words, a vehicle without motive or retarding power applied to the wheels should never be subject to side-slips, and as a matter of fact never is. The adhesion, available for retardation and acceleration, between the wheel of any motor vehicle and the road, is much in excess of what is absolutely necessary, and slipping only occurs when the roads are very smooth and very greasy. At all other times there is probably five or six times as much adhesion as is necessary for propulsion. If a portion of the weight of the vehicle is supported on free wheels, unacted on either by the engine or brake, true rolling contact could be maintained at all times, and the great majority of side-slips would not occur simply because the rolling contact would prevent the initial side-slip and the increased force tending to cause slip due to that initial movement would never come into play.

FRANCHISE FOR PHILADELPHIA BUSES

ANTICIPATING the passage of a measure providing for the operation of motor buses on the streets of Philadelphia, the Auto Transit Company has announced that it will place five vehicles in service early this month and increase the number to forty by July 1. The routes will be between Broad and Spruce streets and Broad and Diamond streets, and between the latter point and Fairmount Park by way of Diamond street.

In its amended form the measure provides for a reduction of the annual license fee from $200 to $100 and imposes a tax of two cents a square yard for repairs to all street surfaces traversed. It is also stipulated that each vehicle be provided with seating accommodation for not less than 30 nor more than 40 passengers.

"JIM CROW" MOTOR BUSES

INDIGNANT over the enforcement of the "Jim Crow" law by the local street car company, the negroes of San Antonio, Texas, have organized the Texas Transportation Company and will operate motor buses. Several machines were put in service last month.

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Industrial Vehicle Trials

Demonstration Lasting for Four Weeks and Covering 1000 Miles to be Held in England

IN order to partially demonstrate the reliability of industrial motor vehicles, but more particularly to establish in a convincing manner the broad superiority of mechanical road haulage over draft animal transportation, and at the same time show what progress has been made of late in the construction of power wagons generally, the Royal Automobile Club of Great Britain, the Society of Motor Manufacturers and Traders, and the Commercial Motor Users Association have jointly decided to conduct trials which will begin on September 9 and continue for four weeks during which period a distance of 1,000 miles will be covered.

The trials will take the form of a tour passing through the chief commercial centers of England and possibly Scotland. The length of each daily run will very according to the class of vehicle. Tests will be made of fuel and water consumption, efficiency of steering gear, hill-climbing capacity, maneuvering ability, and any other tests which the judges may decide to be necessary. Medals, diplomas, and certificates will be given for successful performances. Entries will be accepted in the various classes at the fees shown in the following table, which also indicates approximately the daily mileage:

Class	Load	Entry Fee	Daily Mileage
A	1,000 pounds	$100	70
B	2,000 pounds	100	60
C	3,000 pounds	100	55
D	4,000 pounds	100	50
E	6,000 pounds	100	40
F	10,000 pounds	100	30
G	12,000 pounds	100	30
H	12,000 pounds, trailers and tractors.		

The regulations which will govern these trials have been prepared with more than ordinary care. A draft of them is herewith presented:

1. LOAD.—The load shall be provided by the entrant in such form as may be approved by the judges, and shall be officially weighed and sealed and not changed during the trials unless the consent of the judges be first obtained.

2. ENTRIES.—Not more than two vehicles of the same type by the same maker shall compete in any one class. A vehicle may be entered by its manufacturer or by his authorized agent or nominee, but entries by manufacturers shall have priority. The fees paid by a competitor include the fees for the enrollment of himself and his driver or drivers on the competitors' register of the club. The entrance fee will be returned in full if no trials are held, but will not otherwise be returnable.

3. SPECIFICATION AND GUARANTEE.—Every entrant shall supply to the club, not later than the 13th of July, 1907, a complete specification of the vehicle or vehicles entered by him. If the entrant be a manufacturer or dealer in such vehicles he shall supply, not later than fourteen days prior to the start of the trials, on a form to be provided by the club, a signed undertaking to list and sell vehicles conforming in every respect to such specification for a period of six months from the commencement of the trials; if the entrant be not the manufacturer or dealer then the undertaking shall be signed by the manufacturer or dealer in such vehicle or vehicles.

4. WITHDRAWALS OR FAILURE OF VEHICLE.—In the event of any withdrawal of the vehicle or failure to complete the trial, the vehicle shall be dismantled by the competitor sufficiently to satisfy the observer as to the cause of the failure and to permit such examination by the judges as they desire.

5. VEHICLE UNDER OBSERVATION.—Every vehicle shall be under official control and observation from the time at which it is presented for trial until it is released by the judges.

6. OBSERVERS.—Every competitor shall provide throughout the trials one competent observer per vehicle entered by him. Every observer shall be subject to the approval of the club, and the competitor shall be in every way responsible for his actions, his remuneration and expenses. The observer shall not assist in any way in the adjustment of or repairs to any vehicle. The observer nominated by any entrant shall not be in charge of any vehicle entered by that entrant. Proper seating accommodation must be provided for the observer in a suitable position, and 200 pounds will be allowed for the weight of the observer, his seat and luggage.

7. ASSISTANTS. — A vehicle shall only carry one man in addition to the observer, except in the case of a steam vehicle, where a stoker may be required. All repairs and other work done on the vehicles in the depots (including fuel replenishment) shall be done under the observation of officials appointed by the club, who will make all necessary records.

8. PLATFORMS AND BODIES.—Platforms and bodies shall be subject to the approval of the judges.

9. SUNDAY.—No repairs, adjustments, or other work of any description will be permitted on Sundays.

10. STORES.—Each competitor shall supply all labor, fuel, and stores required for his vehicle during the trials.

11. FUEL CONSUMPTION.—The amount of fuel or electrical energy used by each vehicle during the trials will be recorded. A record will be taken of the time occupied in taking out a set of discharged batteries and replacing them by a set of charged ones, but no account will be taken of the time occupied in re-charging them. The electrical energy used by each vehicle shall be the amount of electrical energy used in charging the batteries.

12. WATER.—The quantity of water used by each vehicle during the trials will be recorded. Water will be provided at the depots, and the time occupied in replenishing elsewhere will be taken into consideration in making the awards.

13. MANEUVERING, ETC. — Maneuvering, adhesion (loaded and light), brake power, etc., will be noted from time to time by the observers for the information of the judges.

14. BASIS OF AWARDS.—The awards will be determined by the judges, who will take into consideration the selling price and the performance of the vehicle in regard to: Accessibility; adequacy of platform area and convenience for loading; adhesion (loaded and light); brakes; condition after trial; cost of carriage per net ton mile (including cost of fuel, lubricants, etc.); cleanliness of vehicle in service and absence of oil and grease leakages; ease of manipulation; finish and workmanship; freedom from nuisance to public, e. g., smoke; general appearance; hill-climbing; maneuvering; quiet running; repairs and replacements; springing; steering gear. No allowance will be made for any wear which may have taken place previous to the trials.

15. MEDALS.—The club will make awards of medals on the recommendations of the judges, and additional money awards from a prize fund, but reserves the right to divide any award, and to withhold any or all of the awards if, in the opinion of the judges, the performance of the vehicle or vehicles is not sufficiently meritorious.

16. DIPLOMAS.—Diplomas may be awarded to those

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vehicles which, in the opinion of the judges are deserving of them, and which have not been successful in obtaining medals under the preceding regulation.

17. ARMY COUNCIL'S DIPLOMA.—The diploma offered by the Army Council will be awarded to the vehicle which is considered by the War Office committee on mechanical transport to be, either as a whole, or in some details of its engines, or other parts, most meritorious from a military point of view, and therefore likely to be of service, even though indirectly, to the army.

18. CERTIFICATES.—A certificate will be given in respect of the performance of every vehicle, whether it completes the trials or not, and the club reserves the right to publish any certificate.

19. TIME TO BE NOTED.—The time spent each day in replenishing, lubricating, adjusting, repairing, and getting up steam, will be recorded on the certificates. The vehicle must be properly washed as often as required, but the time so occupied will not be noted on the certificate. A maximum period of one hour each day, which may be spent at the entrants' discretion before or at the conclusion of each day's run, will be allowed in the depot for replenishing, lubricating, adjusting, repairing, and getting up steam. Any time in excess of one hour so occupied will be added to the running time of the following run.

20. FAILURE TO START.—Any vehicle not ready to start by 12 o'clock noon on any day may, at the discretion of the judges, be prevented from taking any further part in the competition or receiving any reward. If allowed to continue in the trials under observation, it shall resume running at such time as the judges may direct.

24. EXAMINATION. — At the conclusion of the trials every competitor shall open out his vehicle as far as is necessary to enable the judges to carry out their examination, and he shall provide all the labor, tools, etc., necessary for that purpose.

22. STOPS.—No penalties will be incurred for stops made with the consent of the observer for legal requirements, traffic, lighting lamps, fitting non-skids, or for convenience of observer or driver, or for the compulsory stops which may be required. All other stops, including tire repairs, will count against the vehicle as involuntary stops. In the event of any adjustments or repairs being made during a compulsory or voluntary stop, the stop will be counted as an involuntary one.

23. DRIVERS.—A vehicle shall be driven by the same person throughout a day's run, unless that person be incapacitated, when his place may be taken by a substitute, on notice being given to the observer.

24. NOTICE OF REPAIRS.—The driver must not, under penalty of disqualification, make any repairs or replacements without the consent of the observer.

25. SPEED ALLOWED.—No speed above the legal limit will be allowed.

26. OVERTAKING.—The rules of the road must be strictly observed in order that no accidents may occur in overtaking.

27. ROAD REGULATIONS.—Any competitor who in the trials crosses in front of another, shuts in or obstructs another by any means, so that the latter is prevented from advancing, may be disqualified, unless the obstruction was unavoidable, or the competitor who was obstructed was himself in fault; the fact that the obstruction was unintentional, or that it did not affect the results of the trials, shall in no case be admitted as a valid excuse.

28. CONVICTION MAY INVOLVE DISQUALIFICATION.—A competitor who may be successfully prosecuted at law for excessive speed may, if the club is satisfied that the vehicle has been driven at an unreasonable speed, be disqualified.

29. SPEED IN CONTROLS.—The speed within towns and villages and all controls shall be reduced, and in no case shall a vehicle be driven to the danger or inconvenience of other users of the highway. Infringement of this regulation shall subject the competitor to disqualification.

30. CLUB CAN DISQUALIFY.—The club shall have power to disqualify a vehicle for traveling in any place at a speed which it may consider excessive.

31. CONTROLS.—Every town and village through which the route may pass shall be a control, and unless otherwise stated in the route directions, shall be deemed to commence at the first house of such town or village adjacent to the route, and to end at the last house thereof.

32. OFFICIAL NUMBER.—A competitor who shall endeavor to conceal his official trial number shall be disqualified.

33. NOTICE AND METHOD OF PROCEDURE.—A vehicle may be disqualified by notice in writing, signed by an official of the trials, and served on the driver or the person who is in charge of the vehicle. Such notice of disqualification shall set out the act or thing on which disqualification is alleged to rest, provided (a) that disqualification or suspension of a driver shall not of itself be disqualification or suspension of a vehicle, and (b) that, if the act or thing alleged as a ground for disqualification be disputed, the vehicle may continue in the competition, and the question of disqualification shall be postponed, and shall be determined by the club, which shall give all parties concerned an opportunity of being heard, and calling evidence.

34. CLUB'S DECISION FINAL.—In the event of any point arising under, or which is not covered by, the open competion rules and these regulations, the club shall have power to decide upon the same, and its decision shall be final, and shall *ipso facto* become a regulation of the trials.

35.—No advertisement or trade sign shall be carried on or be distributed from any vehicle during any competition, except with the special consent of the club first obtained.

36.—No vehicle having its exhaust so directed as to raise dust from the road surface shall be eligible to compete in any competition on the highway.

37. ENTRANT RESPONSIBLE.—It is one of the conditions upon which entries are accepted by the club that the club shall not be responsible for any damage that may be done to or by the vehicle entered, or its appurtenances, either during the trials or while the vehicle is under the charge of the club, either by fire, accident, or otherwise, nor for the theft of the vehicle, or any of its accessories or appurtenances. The vehicles, and their accessories and appurtenances, shall at all times be at the risk in all respects of the entrants, who shall be deemed by entering to indemnify the club against all legal proceedings, costs, and penalties whatsoever, relating to or arising out of the trials.

38. DAMAGE.—Any damage caused by any entrant or his driver, representative, or servant at any time, and whether before, during, or after the competition, shall be paid for by such entrant. The club is hereby irrevocably authorized as agent for any entrant to settle and agree the amount of any such damage, and, if it thinks fit, to pay the amount thereof, and any such entrant shall on demand repay to the club any sum which may be disbursed by the club in respect of any such damage.

39. ADVERTISEMENTS.—Every competitor agrees by entering that any advertisements he may publish in connection with the trials, or which may be published on his behalf, shall be true and accurate. He further agrees not to publish any advertisement (beyond the fact that his vehicle is competing in the trials) until the issue of the judge's awards by the club.

40. NO CLAIMS AGAINST CLUB.—A competitor by entering or by driving waives any right of action against the club for any damage sustained by him in consequence of any act or omission on the part of the club or its members or representatives or servants, whether with respect to these regulations, or to any regulations to be hereafter issued, or to any matters arising therefrom, or in any manner arising out of or in connection with the competition.

A company has been formed to operate a motor bus line in Gadsden, Ala.

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Gasoline Railway Cars

Mechanical Expert of the Union Pacific is Emphatic in Declaring for Their Economy

PROBABLY no railroad expert in this country is more familiar with the use and economy of gasoline rail coaches than W. R. McKeen, Jr., superintendent of motive power and machinery at the Omaha shops of the Union Pacific. His record as a successful designer and operator of such cars gives him an enviable advantage over others who speculate upon their employment. Naturally, therefore, he had an attentive audience when addressing the New York Railroad Club, one night last month, upon the advantages of the self-contained gasoline rail unit.

Mr. McKeen opened his address by a brief reference to the success his company had had in operating gasoline engines in pumping and coaling stations. It appears that these are delivering power at $1.56 per hp-hour, compared with $1.92 per hp-hour by steam engines. After thus establishing the broad superiority of the internal combustion engine he settled down to an analysis of its value in railroad transportation. Following is a summary of his remarks:

Operating without locomotives has proven popular, because it enables the carriage of passengers and freight by small power units at frequent intervals. Since electrification requires a heavy line investment the car for sparsely settled districts must be of the self-propelled type. Some steam-railroad men still look favorably upon the steam car, but he did not believe there had been sufficient improvement in the steam motor since the dummy days to justify their view.

The modern locomotive and steam-motor car, with high steam pressure and the attendant flue and firebox troubles, are much more complicated than the gasoline motor car, in which, technically speaking, there is nothing present but the vehicle, engine and transmission. As a mechanical man it seemed to him that a gasoline motor car, built with the same skill as a locomotive, is a much less vulnerable machine than a locomotive, and should give more continuous service without failures.

To meet the demand for a low-cost-of-operation, self-propelled passenger car it seemed necessary that gasoline motor vehicles be designed for the special conditions of steam railroad work. Branch lines collect freight and feed the main line, and the limited passenger business can be handled economically when turned over to the main line. Hence, if the steam train could be replaced by a motor car, a great saving could be made in the operating expenses and passenger traffic would be encouraged by the greater frequency of service. The number of trips, cost of operation, etc., is entirely dependent upon the density of traffic and the length of the branch line. On steam railroads in competition with the frequent service of electric lines, a motor car of high power is necessary to obtain the rapid acceleration and high speed required for this class of service. These cars should be constructed, not along the conventional lines of an electric car, a steam passenger coach or railroad locomotive, but on entirely new lines particularly adapted for this class of service.

In designing the body of the motor car three points must be considered, viz., weight, cost and strength. For years in steam-car construction the tendency has been toward a more elaborate interior finish, additional conveniences and numerous other improvements, all of which have added materially to the weight; the length of the cars, large windows, improved couplers, improved draft rigging, trucks, air brakes, etc., has also increased the dead-weight of the car, each ton of added weight making the cost of hauling passengers more expensive. As a result of this trains and locomotives have become so heavy without being correspondingly strengthened that in case of a collision the cars are subjected to such severe shocks that they telescope or go to pieces.

Now that an innovation is being made it seems logical that advantage should be taken of the vast experience in building steam passenger cars by including in the new design all the recent demands for improvements that will insure the safety of passengers should the car get into a wreck or turn over. Hence, the Union Pacific car is of steel only. Instead of having an underframing of excessively heavy sills with a light cracker-box framing above, his company had endeavored to make the whole car body a unit structure. The underframing comprises but one moderately heavy center sill; the side sill is a light-weight continuous channel extending around the body of the car. From this outer channel bar continuous steel ribs run up the side through the roof and down the other side of the car, secured to each other by suitable cross-braces. The sides of the car form a truss, the plate of the car being the top chord and the sill the bottom chord. This framing is well tied together at all points, and is further re-enforced and strengthened by the sheet-steel covering. The ends of the car are strengthened by the round shape at the rear and the pointed lines in front. In a collision this car could be punctured or bent, but it could not be telescoped.

One of these cars in an accident struck a switch locomotive while running at about 30 miles an hour. The car was struck in the rear and but slightly damaged; the steel plates were bent up, the ribs of the car were loosened and badly bent; but the frame of the car was not damaged except at the point of impact. Beyond the point where the car was struck the paint was not even cracked, showing that even under this severe shock there had been no unequal movement of the members of the steel frame.

The power transmission system of the latest type of Union Pacific gasoline car, after the car is once in motion, consists simply of an engine and a sprocket mounted on a crank shaft, the power being transmitted through a chain to a second sprocket keyed to the driving axle. The car operates on the high gear all the time.

The Union Pacific motor cars were originally designed so that the speed of the car could be controlled by varying the speed of the engine; accelerating or retarding car speed by opening or closing the throttle and advancing or retarding the spark. No. 8 is equipped with a six-cylinder 200 hp. engine. The hope for flexible control has been fully realized, the engine being able to start and accelerate the car from zero to 60 miles an hour by varying the engine speed. The cost of fuel, consequently, is in proportion to the power demanded of the engine. This flexible control is obtained through the following: (1) utilization of six cylinders, giving a power impulse to the shaft three times each revolution; (2) by balancing the crank shaft and reciprocating parts the uniformity of speed is improved; (3) the gasoline vapor pipes from the carburetor to the cylinders are all equally divided, so that the distance the vapor travels is the same in every case, and thus no one cylinder takes its charge of gasoline at the expense of another; (4) the dimensions of the cylinders, the opening and closing of the inlet and exhaust valves and their timing to each other, as well as to the piston; (5) the valve motion of a six-cylinder gasoline engine is analagous in many ways to that of a steam engine, the idea in such a gasoline engine being to produce uniform horse power by the cylinders at various speeds.

The speed of the car is varied by the use of the friction clutch. At a speed of two or three miles an hour the load is assumed by the engine without the bucking often seen in automobiles. The throwing on or off of the clutch is governed by air, controlled by an operating valve, the lever of which is small and is in the hand of the operator. Hence, the engineer can keep his

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head out of the window, watch the brakeman and handle the engine.

The expense for fuel, repairs, cleaning, etc., runs very uniformly, but as the cost per mile is so largely dependent upon the number of miles run per day, as well as on the wages paid the car crew, comparisons are very unsatisfactory. In actual service cars run some months as low as 10 and 11 cents a mile. In some localities the cost is as high as 16 and 18 cents a mile. In one case, where a 100 hp. motor car and trailer has replaced a steam locomotive and train the cost of operation runs as high as 20 cents a mile. On branch lines the motor car should make not less than 100 miles a day. To man the gasoline car with a steam car crew is exceedingly expensive and does not produce the proper results.

* * *

During the discussion which followed Mr. McKeen's address a representative of the railway engineering department of the General Electric Company remarked that while the general design of the Union Pacific motor car was praiseworthy, yet the method of transmission was, in his judgment, inferior to the gasoline-electric drive. He admitted that the car developed by the General Electric Company weighs 30 tons as against 26 tons for the Union Pacific car, but he denied that the difference in weight was wholly chargeable to the electric equipment. With electric transmission it would not be necesary to use a truck of more than 75-inch wheel base, while the like power with mechanical transmission calls for a truck with a 9-foot wheel base. It was further contended that the electric transmision gave opportunity for placing the machinery to better advantage for operating and inspection. Its better speed control was generally admitted. As to net efficiency, he was reluctant to admit an efficiency of 92 per cent for mechanical drive against 81 per cent for electric drive. Real efficiency, however, is to be measured by gasoline consumption, and in the long run this should be less with electric transmission since it permits the engine to operate at its most efficient point at all times.

A representative of the American Locomotive Company referring to Mr. McKeen's statement concerning the constant operation of the Union Pacific's car on high gear, said he thought there must be very considerable slip on the clutch in starting. He wanted to know of what those clutches were made, what became of the heat lost in friction, at what point does it slip, what is the principle of construction, and what are the r. p. m. of the engine at that time. It seemed to him that the horse-power then must be much less than 200. He also expressed surprise at the efficiency which the representative of the General Electric Company claimed for electric transmission. When he himself was in Europe the engineers of one building company claimed only 65 per cent, but perhaps this difference may be due to the fact that they used smaller motors, about 30-hp. to 35-hp. He also gave the following figures on the cost of operation of motor cars on the Hungarian state railways, which has 37 for passenger and light-goods service. Of these 32 are of the gasoline-electric type. Ten cars are of 70-hp. capacity, weigh 20 tons, run 2.9 miles per gallon at an average speed of 35 miles an hour; the 35-hp. cars weigh 40 tons, including two trailers, and run 3.75 miles per gallon at an average speed of 20 miles per hour.

From among other information pertaining to the operation of railway motor cars which the representative of the American Locomotive Company picked up while abroad the following was presented: Great Western railway, England, steam car, 250 hp., weight of train with one trailer 55 tons, operating cost per train mile 13 cents, including fuel, oil, repairs and driver's wages, cost of fuel practically $3 a ton delivered, driver's wages $1.75 per day, 20 lbs of coal per train mile, average speed 35 miles per hour; Northeastern railway, England, gasoline-electric car, 85 hp., claimed gasoline consumption equal to 3½ miles per gallon, average speed 30 miles, cost of gasoline about 25 to 30 cents per gallon, operating cost estimated 15 to 16 cents per train mile; Paris-Orleans railway steam car with 260-hp. boiler, weight of train 50 tons including one trailer, operating cost 8 cents per train mile; coke $6 per ton, driver's wages $1.04 a day, fuel consumption 21 lbs. per mile, average speed 35 miles per hour. On the Hungarian state railways a Ganz steam car weighed 35 to 40 tons, including two trailers, operating cost 7½ cents per mile, coke $5 per ton, driver $1.20 per day, fuel consumption 9.6 lbs. per car mile, average speed 25 miles per hour. Another car was of the gasoline-electric type, rated at 70 hp., weighed 20 tons, operating cost 7.3 cents per mile, cost of gasoline 10 to 11 cents per gallon, ran 2.9 miles per gallon, and had an average speed of 35 miles. A second car of the gasoline-electric type, of 35-hp. capacity, weighed with two trailers about 40 tons, cost 5.7 cents per mile, ran 3.75 miles per gallon, and had an average speed of 25 miles per hour. A steam car on the Austrian state railways of 100-hp. capacity weighed 50 tons including two trailers, cost of fuel $3.25 per ton, operating cost 5 cents per train mile, wages $1.25 a day, fuel 15 lbs. per mile, and the average speed was 25 miles per hour.

* * *

In closing the discussion Mr. McKeen said he was often amused upon hearing it said that mechanically driven gasoline railroad cars were not operating with success. If anyone doubted the success of the Union Pacific motor car services they could acquire faith by going to the Missouri River and observing the regularity and economy of their operation. He did not want it understood that he had said the horse-power was uniform throughout. The losses due to the uneconomical running points of a gasoline engine were like those found in any steam locomotive, which, at times, is very extravagant of power. A similar criticism could be made with regard to electrical machinery, for everyone knows that the method of control involves resistance losses. With regard to the friction-clutch used, this was of cast-iron on cast-iron, being nothing more than a disc with wood inserts capable of absorbing almost any amount of power. It is true that it heats, but not so much as to affect the operation.

Plans are afoot for the operation of motor buses in Rochester, Minn.

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Spreading the Gospel

Automobile Clubs Need Enlightenment Concerning the Economy of Industrial Motor Vehicles

PERHAPS less is known about the value of the commercial motor vehicle by owners of touring cars who do not have occasion to study road transportation than any other class which is casually attracted by its employment. Automobile clubs are notoriously ignorant of the problems of motor road transport, and yet, strange to say, intending purchasers of wagons frequently appeal to the members of such organizations for advice which will enable them to come to a decision. Something should be done for their enlightenment. They are not ignorant by choice. Indeed they are generally well informed, but as they only catch the gossip and small talk of motor road transport they undervalue its economic importance and misrepresent it. They are well meaning friends whom it would pay to have wel informed.

A start in the matter of educating them has been made in the east, Fred H. Adams having been extended the privilege of addressing the members of the Bay State Automobile Association upon the use and abuse of commercial motor vehicles. In part the speaker said:

Motor wagons employed anywhere but in short-haul service will pay the merchant, the manufacturer, the expressman, the light parcel delivery companies, the butcher and the baker—indeed, and all who are obliged to deliver goods at distances of two miles or more. I have known a motor delivery car do the the work required of 10 horses, five drivers and five helpers. The wagon did this work easily in less time, and with one operator and only one helper on the car. The route was covered day in and day out, on an average of two hours less time than by the use of horses. The first cost of motor wagons is not high considering that one will displace from two to five horse-drawn wagons on most any route except short city ones where stops are frequently made. There is not a motor delivery car running in Boston that has not displaced at least four horses. One gentleman connected with one of Boston's largest department stores tells me that on some of his routes the car displaced five horses, five drivers and five helpers, and the business over the route where automobile delivery was installed was increased in some instances fully 50 per cent.

I know 52 drivers of horses who have learned to operate motor wagons. In my opinion the good horse driver is the logical operator for motor trucks and delivery cars, because he knows how to handle the different kinds of merchandise to the best advantage. He knows how to drive through crowded streets, too, as he has been accustomed to such traveling with a horse-drawn vehicle at a slow rate of speed. For many other good reasons he is fitted to drive commercial motor cars. There are hundreds of men in the employ of express companies, department stores and in other lines of business who are ambitious to better their condition and receive larger wages. They are temperate and responsible and have large sums of money and valuable merchandise placed in their charge. This business training is worth something. It is a very rare thing to hear of a betrayal of trust by this class of men.

The purchaser of a motor wagon will tell the salesman, dealer or manufacturer that he doesn't wish his car to make a greater speed than 10 to 12 miles per hour. He lays out a route of from 10 to 12 miles, which totals, with the return trip, about 25 miles. Then the storekeeper wants to get in some extra trips and save more time. He has found that the car returns early and waits around for some time for the next delivery. What does he do? He generally increases the distance and tells the operator to make a return from the extended route in the same time as on the first trip laid out. This means speed; speed in locomotion electric car, steamboat, horses or man, means cost through excessive wear. Then something goes wrong with the car and the purchaser says it is no good, that it costs more than horses. The car can deliver the goods, but the storekeeper has given the machine no attention, nor will he allow sufficient time to repair the car. Usually he waits until something breaks before purchasing parts. Now the moment a horse shows signs of straining or lameness he is laid up for repairs. The motor car, on the contrary, goes on until the break occurs and then the purchaser puts the blame where it does not belong.

The remedy is evident. The purchaser must not expect because the motor delivery car is a machine that it does not need attention. If he gives the machine a chance to rest and an occasional needed inspection, the mishap would not have happened. Locomotives and electric cars are looked after systematically; give the motor wagon the same inspection and care and it will prove a good servant and a money-making investment for the investor.

Club addresses of this and like sort are too seldom heard. Indeed, if the truth must be told, the atmosphere of an automobile club is not in the least vitalizing. It should be easy to make it tonic. Most men like to be informed of important matters in advance of the rest of the world. Pleasure is not always found in its keen pursuit. Occasionally it is amusing to be intellectual.

BUSES FOR JAMESTOWN EXPOSITION

FOR the convenience of visitors to the Jamestown exposition twelve electric buses, each with capacity for 20 passengers, will be operated by the Exposition Motor Transit Corporation. These machines are not new. All of them were used for similar service at the St. Louis exposition. They are equipped with two motors, low speed and single reduction, and have a traveling radius of about 30 miles on a single battery charge.

Four hundred motor cabs have been ordered for use in St. Petersburg, Russia. Service will begin about the middle of the year.

NOISELESS STEEL WHEEL

MUCH interest has been aroused by the production in Germany of a cast steel wheel with an inner rim turned for the reception of a flat ring of rubber about .75 of an inch thick, over which a steel tire is laid by hydraulic pressure until the rubber layer is reduced to .6 of an inch in thickness. Tests have proved that the rubber so compressed is durable, and that it is singularly effective in deadening noise.

Considerable headway is being made in organizing a company to operate motor buses between Fond du Lac and Portage via Ripon.

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MOTOR BUSES IN PARIS

NOBODY expects that motor buses will soon be seen on the streets of Paris in as great numbers as they are found in London. This, however, is not due to any disinclination on the part of Parisians to make use of such vehicles. The fact is, the omnibus business of Paris is a monopoly, and as a result there can be no competition between motor bus companies such as exists in London.

At the present moment there are about 100 motor buses operating in Paris. It is popularly supposed that their engine fuel is denatured alcohol. As a matter of fact, however, the fuel is a mixture of benzol and alcohol in equal proportions, which has an efficiency of about 7 miles to the gallon and is much cheaper than gasoline.

The buses used in Paris are singularly silent in operation. The regularity of the service, too, is splendidly maintained. Another feature of superiority in the Paris bus service is the absence of offensive odors from operation, due to the fact that the exhaust takes place high up in the air. All the vehicles are fitted with four-cylinder vertical engines developing 40 hp. at 900 revolutions. The maximum speed is 17 miles per hour. The bodies have capacity for 30 passengers, 16 on the inside and 14 on the outside. The fare for an inside seat is 3 1-3 cents, for an outside 1 1-2 cents. Transfers are supplied to passengers who desire to ride on the horse bus connections.

The absence of side slip is a distinguishing feature of the Paris motor bus service. In part this is due to the cleanly condition in which the streets are kept. The tires with which the vehicles are fitted, however, are really responsible for the absence of this great evil. Ordinary solid tires are no longer used. The new type of tire consists of sections about 6 inches long. Between each section there is a space a little more liberal in dimension than the average tire maker is accustomed to give. There is a flange on each section over which an endless section of iron is bolted. A section can be removed in a few minutes. Some of the sections are even with the wheel periphery, some are set at an angle to it. The sections cost about $2 a piece. Triple tires are fitted with 22 x 3 inch sections, while twin tires have 22 x 2 inch sections.

The company operates these vehicles in a very conservative manner, carrying a much larger number of spares than are actually required. When it owned 50 vehicles only 36 were put upon the road, the remainder being held in reserve.

The machines are active throughout the day, except between one o'clock and six o'clock in the morning. The daily average for each vehicle is about 88 miles. Drivers are paid about $1.50 for a working day of 11 hours. The drivers are always recruited from the ranks of the company's horse bus operators. They are trained in large batches, as many as thirty at a time being schooled. Even after they have been licensed by the police authorities they are mounted alongside of an experienced motor bus driver until the company's superintendent is thoroughly satisfied that they are competent to handle the big machines in public service.

The omnibus situation in Paris is peculiar. In 1854 it was found that the competing systems of 'buses in Paris did not serve the public and did not pay the companies; therefore the government ordered all the companies to combine into one homogeneous undertaking, and granted it a concession which has been renewed on several occasions, and expires in 1910. Under this concession the fares are regulated, the routes fixed, and other conditions imposed. The company pays about $200,000 a year to the municipal exchequer, and an extra toll for each omnibus beyond the amount fixed for a minimum number of buses. They have to maintain waiting rooms for passengers. Conductors and drivers wear uniforms. Special services are provided for workmen, and these are subject to other conditrons.

The original grant by the municipality to the Compagnie Generale des Omnibus was an exclusive right to conduct surface traffic within the city limits. For a time the company made good use of its monopoly, paying good dividends and giving good service with its horse-drawn buses. Realizing, however, the futility of endeavoring to cope with the constantly increasing passenger traffic by means of horse-drawn buses, the company secured concessions for steam street car lines, several of which are still running, and conceded to other street car lines the right to operate steam, cable, compressed air and electric cars.

Six years ago the municipality broke faith with the company by allowing certain street railway companies, whose lines were outside of the city, to penetrate within the domain of the Compagnie Generale des Omnibus. Threatened by competitors who are egged on by the municipality, the position of the company is not an enviable one.

FRENCH DEMONSTRATIONS

FROM May 20 to June 10 a series of public demonstrations of industrial motor vehicles will be held in France. An elementary endurance test will be followed by a final ton-kilometer test. Five classes of vehicles will be demonstrated as follows:

1. Vehicles carrying from 50 to 500 kil. of goods.
2. Vehicles carrying from 500 to 2,000 kil. of goods.
3. Vehicles carrying from 2,000 to 3,000 kil. of goods.
4. Vehicles carrying over 3,000 kil. of goods.
5. Vehicles carrying passengers (minimum six).

No vehicle must weigh more than nine tons when loaded. The maximum speed for any vehicle will be 15 miles an hour. The minimum speed for Classes 1 and 2 will be 10 miles an hour, 7½ miles for Class 3, 6½ miles for Class 4, and 10 miles an hour for Class 5. For the first four classes the daily distance to be traveled will be about 95 miles. Vehicles of the fifth class will travel 125 miles daily. The daily stages will be divided into sections, so that vehicles arriving before their time will have to stop until the proper time of their arrival. Vehicles arriving after the maximum time allowed will be disqualified from further competition.

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H. E. COFFIN

MOTOR VEHICLES IN HONDURAS

EVEN in Honduras the industrial motor vehicle is satisfactorily demonstrating its superiority to draft animal service, several gasoline machines loaded with freight and passengers being operated over a 90 mile strip of road between San Lorenzo and Tegucigalpa. This road was built six years ago at a cost of something like $2,500,000 and, barring its sinuous character and many severe gradients, is a fairly good highway in dry weather. Constant braking and innumerable speed changes cause considerably more wear on gears and tires than would be the case if the roadway was straight and level. Grades up to 16 per cent are common.

The average load is eight or nine "cargoes," a cargo weighing 250 pounds and representing the full load of a mule in that country. The route is generally covered in less than twelve hours. The vehicles are mostly of the four-cylinder type, each cylinder measuring 5¼ by 6 inches Twin tires are fitted to rear wheels. The capacity is 10,000 pounds. The weight unloaded is 7,000 pounds, and the nominal horse power is 45.

During four months of the year it rains. In the wet season low loads are carried. As it takes a mule carrying 250 pounds from five to seven days to travel the 90 miles, and a bull cart carrying 1,200 pounds from ten to fifteen days, the advantage of the motor vehicle is very apparent. There are no railroads in Honduras.

WIRE ROPES FOR BRAKES

BRAKE rods versus brake ropes is a subject of hot dispute among engineers who are concerned with the construction of heavy motor vehicles just now. The discussion is given unusual interest by reason of the assertion, refuted with as much proof as its upholders can present, that the seven-ton bus which was recently wrecked in England would not have become unmanageable if its wire brake ropes had remained intact.

Advocates of the wire rope method of actuating brakes declare that when rods are used their eyes or forks, which are welded on, are not reliable, while a wire rope has no joints and is much stronger than a solid rod, metal for metal. Steel rods may have a breaking strength of, say, 30 tons per square inch, while the wire from which the ropes are made can have a strength of from 90 to 110 tons.

On the other hand the advocates of the rod actuated brake contend that all the evidence goes to show that since the driver of the ill-fated bus had endeavored to apply the rear wheel brakes, and found they would not work, it is evident the wire ropes actuating them must have been broken. This contention is not allowed, as the failure of the ropes to act might have been due to some of the brake pin connections having given way. Besides, apart from this, we have the evidence of two or three passengers that the brake blocks fell on the road. Accepting this as a fact, the evidence is conclusive that the wire rope was so strong that it put pressure on the brakes sufficient to make them adhere to the wheels to such extent as either to break or tear them away from their attachments.

MOTOR WAGONS IN THE CONGO

WHATEVER faults of character contemporary historians may ascribe to the crafty King of the Belgians, shortsightedness is not in the list. In the course of a recent interview he declared that motor freight wagons are now operating in the Congo State over roads especially constructed for the purpose and extending from the Congo river into parts of the interior not likely to be penetrated by railroads for some time to come. The building of these roads has been in progress two years and two of them have already been partly equipped with rolling stock.

One of these roads is 300 miles long. It is soundly constructed, rock ballasted and perfectly drained. Steam wagons are employed, one of the largest being capable of hauling a train of trailers. These machines penetrate to the rich mining region of Katanga. To reach the Katanga province heretofore steamboats have ascended the Congo, the Kasai and Sankuru rivers a thousand miles to the head of navigation on the Sankuru at the western edge of Katanga. From this point many hundreds of porters have carried freight across country to Lake Mwero, the air line distance being about 400 miles. For half this distance navigable waters may be utilized.

Automobile roads have now been built to connect these navigable waterways leading in the desired direction. Bridges have been thrown across rivers, the sections of the road have been built in the best European manner and the automobile service is in operation, though as yet with inadequate equipment.

A more northerly road has also been constructed from the head of navigation on the Sankuru to a large collecting and distributing center, where parties of porters are kept to carry the automobile freight in various directions.

The Congo State was encouraged to carry out these enterprises by the success of the automobile route from the east coast of Madagascar to the capital, Antananarivo, about 120 miles inland, which has revolutionized transportation. As late as 1901 the cost of moving freight between the sea and the capital was $75 a ton. The new road has reduced rates three-fourths. A daily service of automobiles for passengers and freight is maintained between the Indian Ocean and Antananarivo. The people are happy over the change, but the automobile will resign in favor of the railroad to the capital, which, it is expected, will be completed in 1908.

The Congo State also has in view an automobile road between the Upper Congo and the Nile, a distance of about 500 miles. This enterprise, however, is as yet only a project.

Two rural mail carriers in New Paris, Ohio, use automobiles in their work.

Sight-seeing automobiles are now to be found in Calcutta, India.

An automobile stage line is to be established between Ault and Fort Collins, Colorado.

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ALCOHOL TESTED AS A FUEL

RECENTLY one of the prominent automobile manufacturers of the country attempted to ascertain the relative advantages of gasoline, alcohol and kerosene as fuels. Three cars, fitted with 20 hp 2-cylinder engines, and of identical general construction, were employed for the test, which was conducted from Jan. 28 to 30 on the road between New York and Boston, a distance of 249 miles.

As a result of the experiment alcohol was shown inferior to gasoline or kerosene, but its cost, estimated at 37 cents a gallon is undoubtedly too high, and therefore it would not be safe to form conclusions from the performance in question. Assuming that alcohol could have been bought in this country as cheaply as it is sold in Germany—there it sells at 18 cents a gallon wholesale—the result of the test would have been quite different, although the superiority of gasoline would still be apparent.

No special carburetting devices were fitted to either the kerosene or alcohol car, obviously another advantage for the gasoline machine. The weights of the cars were: For the gasoline car 2,270 pounds; for the kerosene car 2,520 pounds, and for the alcohol vehicle, 2,750 pounds. The consumption ranged roughly at 24, 33 and 40 gallons for the 250-mile trip, which work out at 10, 7 and 6 miles per gallon, respectively.

Toward the conclusion of the run the kerosene machine began to manifest signs of lagging, probably due to the formation of carbon deposits on the walls of the combustion space, and knocked badly, owing to pre-ignition on this account, as was inferred. The provision of spark gaps in the ignition circuit, however, prevented the missing, which, otherwise, might have been expected to occur. The actual running time for the three vehicles was 16 1-3 hours, giving an average rate of 15.47 miles per hour.

One of the official observers of the test says that in order to be on a par with gasoline at 20 cents a gallon, alcohol must be purchasable at 22 cents a gallon, and must be used in a specially constructed engine giving 10 per cent more thermal efficiency than does the gasoline engine.

In a subsequent test a fuel composed of a mixture of kerosene and gasoline was used instead of kerosene alone. For this test two fuel tanks and two carburetters were employed, the arrangement being such that the mixed gas supplied to the motor averaged a ratio of something like 3 to 5, the kerosene being used in smaller amounts. With this fuel there was noticed an increased power efficiency, lower cost, and a marked diminution in unpleasant odor from the exhaust.

A syndicate has been formed to operate automobile freight and passenger lines throughout Italy, taking advantage of the government subsidy allowed promoters of such transportation.

One of the largest trucking companies in Berlin has just announced its intention to gradually replace all of its horse-drawn wagons with motor wagons and trucks.

Brewery Wagon

BREWERS who have hitherto only employed electric trucks are beginning to realize that gasoline wagons can powerfully supplement their road service in making distant trips which are beyond the battery capacity of the ordinary electric vehicle. Mixed installations, where the business will warrant them, are becoming rather common since one of the biggest breweries in the country recently decided to buy some three and five-ton gasoline machines to cover outlying territory which could not be conveniently worked by its electrics. Many small brewing companies throughout the country are using gasoline wagons, particularly where high mileage, long hours of work and customers far apart are conditions of service. A three-ton Knox wagon for such service is shown above. It is employed by the Seattle Brewing Co., of Seattle, Wash. Its body is 12 feet long, 5½ feet wide, and at its top 9 feet above the ground.

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LIGHT BUSES ARE MOST ECONOMICAL

RECORDS which establish the economy of the motor bus are not easily procured. Even when they are available they do not inform us if the use of vehicles with large carrying capacity is more or less profitable than the employment of those having small capacity. The knowledge which it is most desirable to parade, as a guide for those calculating to operate such service, is either purposely concealed by those who possess it or else it is not rated at its proper worth.

Occasionally, however, one is permitted to know something of the methods by which public service companies are enabled to pay a profit and the manner in which the relative cost of maintaining the various sizes of vehicles is ascertained. The service of La Compagnie des Messageries Automobiles in France is typical of a highly developed passenger and baggage carrying business. It has employed both large and small gasoline vehicles, but after three and a half years' experience admits that the small buses are the most profitable, costing less for repairs and maintenance than the large ones though traveling twice the distance. Furthermore the small buses do not cause any more labor on the part of the operating staff, or show any more wear and tear of machinery, than do the larger vehicles. This might indicate that the design of the little vehicle was worked out with the most intelligence, rather than that big loads cannot be carried as economically as small ones where the loads are constant. The company, however, does not hesitate to say that, eliminating drivers' wages and granting equality of design, a motor bus with capacity for 18 passengers is more expensive to maintain for a given mileage than one carrying 10 or 12 passengers. If the extra cost of maintenance is not due to faulty design it is more than likely assignable to inconstancy of paying load.

At first the cost of maintaining solid rubber tires on the company's buses, taking large and small vehicles together, was about 4 cents a kilometer, which is 5/8 of a mile. Later it dropped to 3 cents a kilometer, and now is down to 1¾ cents, which represents a daily expenditure of about $3 for a bus traveling 125 miles. The manager of the company is confident he can still further reduce tire maintenance and within the year have it as low as one cent a kilomter. Radical alterations in the design of the body of the vehicle, such, for example, as the removal of the back platform and extended overhang, have already given tires a longer life.

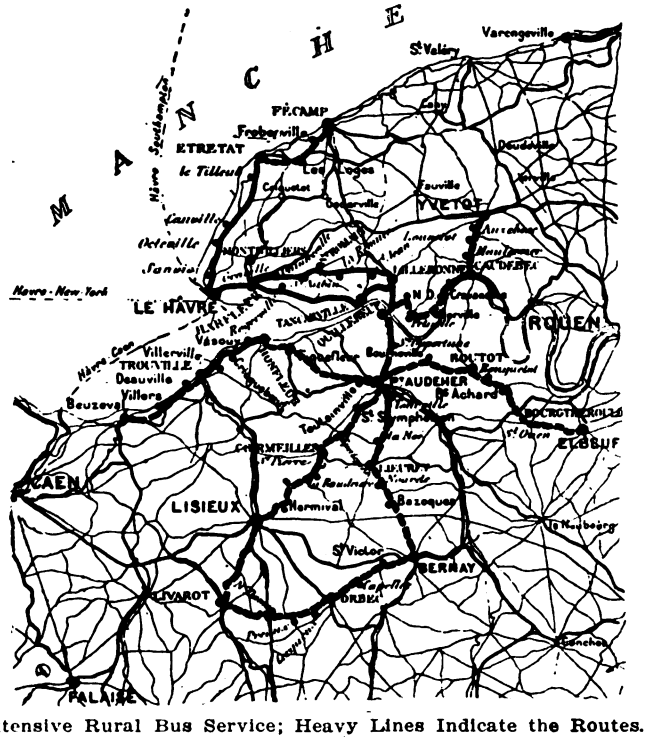
Some idea of the soundness of the company's method of administering its buses may be gathered from the fact that the first 16-passenger vehicle put in service three and a half years ago has been operated 350 days of every year since the middle of 1903, traveling 110,000 miles. This bus is still in first-rate running order.

The fare is fixed at 2 cents a kilometer. Baggage and parcels are transported if each piece does not exceed 220 pounds in weight. The revenue from this source represents about 7 per cent of the gross earnings. When there are thirty buses in service the total cost of operating each, including drivers' wages and administrative expense, will be about $8 daily. At present the cost of operation is about $10 per bus per day.

The consumption of lubricating oil, which was 1 litre per 3 kilometers with 15-20 hp. motors of 16-seat buses, came down to 1 litre for every 5 to 6 kilometers with the light buses furnished with 12 hp. motors.

Each bus has its own driver and conductor, the latter loading and unloading the baggage on the top.

In a few months the company will be operating 40 motor buses and covering routes aggregating 315 miles. The accompanying map shows the bus routes. The decision to use nothing but light vehicles with seating capacity for 10 or 12 passengers, traveling at 15 miles an hour and plying for traffic at short intervals, was reached after a tedious and costly demonstration with larger vehicles carrying 20 passengers plying for traffic at long intervals and traveling at an average speed of 10 miles an hour. Frequency of service is always highly prized by the public. The light buses, owing to their seped, can make many more journeys over a given route than the heavy vehicles and naturally the receipts from the service grew as conveniences were extended to the public. While in the main the company relies upon light buses the heavier ones are used on days when the pressure of traffic is severe. The light buses carry from 10 to 12 passengers and about 700 pounds of baggage.



Extensive Rural Bus Service; Heavy Lines Indicate the Routes.

Summing up the experience of this company it is demonstrated that in populous districts motor buses with reduced passenger carrying capacity yield the best service and the greatest earnings, while entailing the least expense in operation and administration.

A company has been organized at Lake Pleasant, N. Y., to operate a motor stage line between that place and Northville, a distance of 30 miles.

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Information for Buyers

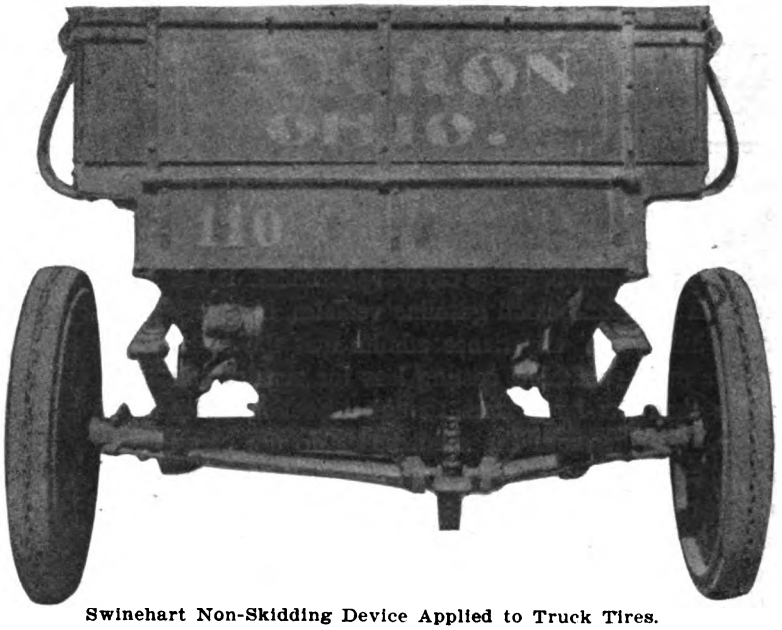
POLICE PATROL WAGON.—The police patrol wagon made by the Oscar Lear Automobile Company, of Columbus, Ohio, is fitted with a 50 hp. air-cooled engine, having four cylinders with 5½-inch bore and 5⅛-inch stroke. The wheel base is 122 inches. Wheels are 36 inches diameter, fitted with 4½-inch tires. The total weight of the vehicle is 2,850 pounds. Its maximum speed is 60 miles an hour. It will carry eight people in the body and two on the driver's seat.

JAMESTOWN EXPOSITION EXHIBITORS—At the Jamestown exposition the Rapid Motor Vehicle Company is showing the largest line of motor delivery wagons, trucks, buses and sight-seeing cars ever displayed by any one concern. The exhibit covers 1,100 square feet of floor space and displays the firm's complete line. Demonstrations are made for prospective customers.

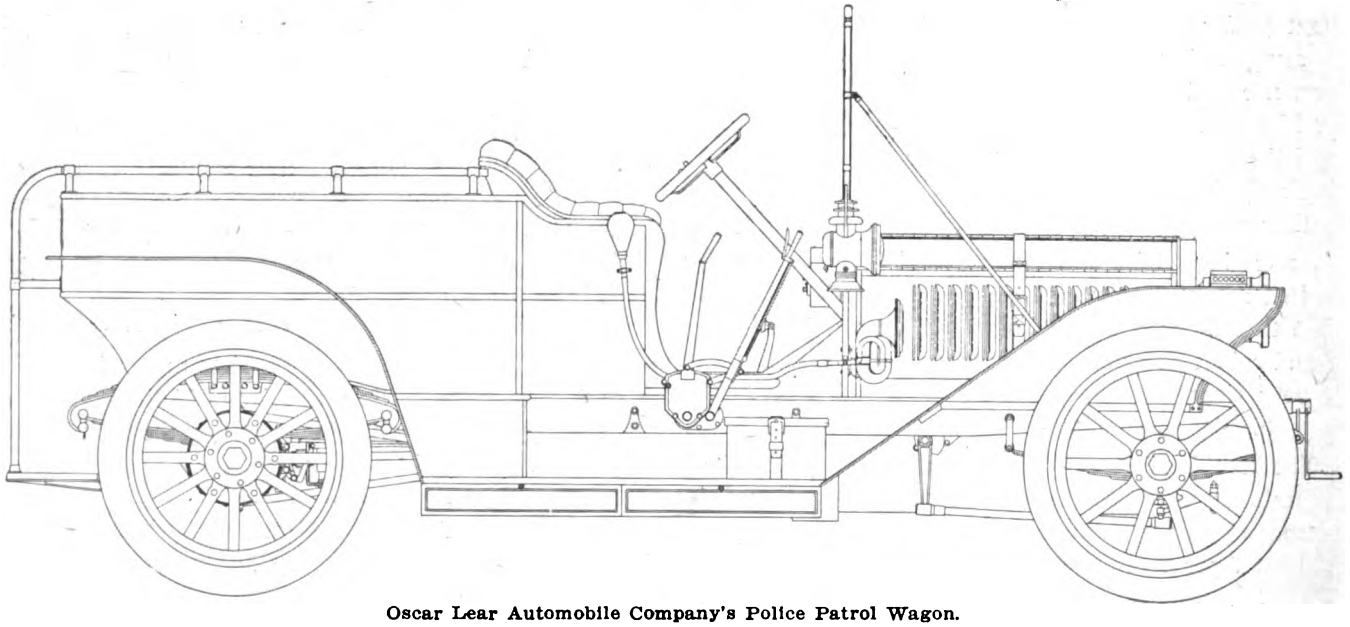
SPRING MAKERS NEED MORE ROOM.—The Detroit Steel Products Company, of Detroit, recently purchased twenty acres of land on the Michigan Central belt line on which it will erect an immense factory for the porduction of automobile and railroad car springs and forgings. The tract is nearly half a mile in length. The company's new factory will be 450 feet long with two wings each 100 feet long. The Detroit Steel Products Company was organized in September, 1904, starting in a leased building. It was evident in a very short time that this building was inadequate for their rapidly growing business, and the development noted above is the result.

CATALOGUE OF AUTOMOBILE PARTS.—The rapid development of the automobile has wrought so many changes in construction from year to year that the earlier models are in some cases hardly recognizable. Of course it is fair to suppose that many of the earlier designs are now considered obsolete; hence parts for same are not much in demand. But the later models of which many may be seen in use throughout the country, would frequently be improved if worn parts could be readily replaced with new ones. Few have any idea of the many parts that are used in the construction of an automobile, or the difficulty of arranging them in catalogue form so that the inexperienced are enabled to intelligently select the part needed. This has been done in an exceptionally simple and yet most complete manner by the Pope Motor Car Co., Indianapolis, manufacturers of the Pope Waverley electrics, in their catalogue of parts just received. The arrangement is excellent, illustrations are used throughout, parts are divided into groups and are also indexed and numbered so that any particular part can be readily found.

NON-SKIDDING TIRE.—J. A. Swinehart, president of the Swinehart Clincher Tire & Rubber Company, Akron, O., has devised a method for preventing tire slippage in motor wagon and truck operation. The tire is grooved, and in this groove is drawn a tight and closely linked chain. The chain comes in contact with the road surface and prevents sideslip or skidding. It is claimed that considerable power is saved by the use of the chain, owing to the increased traction its use affords. The chain can be used to repair any tire that has become loosened at the base and pulled away from it. A tire so loosened will, by the application of this chain, become fit for service again. It is understood that the Swinehart company will grant licenses to other tire manufacturers to fit this non-skidding device to their motor wagon products.



Swinehart Non-Skidding Device Applied to Truck Tires.



Oscar Lear Automobile Company's Police Patrol Wagon.

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Postal Wagon Exhibited by the Government at the Jamestown Exposition.

GOVERNMENT EXHIBIT AT JAMESTOWN.—During June and July, 1906, the Post Office Department conducted some very comprehensive tests of the Orient friction drive buckboard as adapted to rural free delivery service, two cars being employed in tests, which were conducted over some of the worst routes that could be found in Maryland, Virginia and the District of Columbia. The cars came through with a perfect record, not a single stop being made for repairs or adjustments; nor were any adjustments made at the garages between the tests. The government had a very competent official in charge of the tests, and his report was of such a satisfactory nature that the prohibition was removed against R. F. D. carriers using motor vehicles on their routes, it having been previously considered that they were unreliable and could not serve a route with regularity. While the use of any type of motor cycle or motor car was permitted thereafter, the buckboard was recommended on account of its light weight, small cost and flexibility of control by means of the friction transmission as probably the most desirable for use by the mail carriers, who work on very small salaries.

As a result of these successful tests the Post Office Department has since then taken a great deal of interest in motor vehicles and their adaptability in service of the various departments of the postal service. Of their own initiative they requested the loan of a single-cylinder buckboard runabout, complete with top and lamps, such as was used in the government tests, and this car they are today showing in their own exhibit at the Jamestown Ter-Centennial Exposition at Norfolk, Va. In the exhibit they show the various types of vehicles and modes of conveyance which have been used in R. F. D. service since its inauguration, and the buckboard takes a prominent position as the very latest method of delivering mail on country routes. The department went even further and ordered two 8 hp. service cars built up into the regulation screened wagons used in the cities for the conveyance of mail pouches. These two cars are for the use of the exposition post office, located in the government building at the Jamestown Exposition. One car is required to make nine round trips per day between the exposition post office and the Norfolk post office, representing a total distance of about 90 miles per day. The second car operates between the exposition post office and the steamship docks at Pine Beach, in addition to which it distributes the special pouches among the different buildings at the grounds. This second car will negotiate about 50 miles per day.

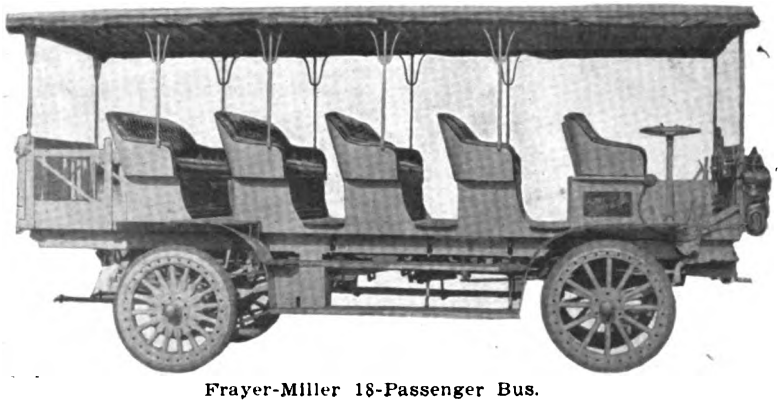
A permanent garage has been erected on the ground by the post office department for the accommodation of these two cars, and by means of their use the electric car service between Norfolk and the terminal at the Exposition grounds has been abandoned.

William A. Barr, assistant representative of the post office department at the Jamestown exposition, who is also post office inspector, is in charge of this motor car service, and both cars will participate in the test of automobiles adapted for mail service, which will be conducted during the summer under the supervision of Gen. Frederick D. Grant. It is worthy of comment that Mr. Barr is the government official who was in charge of the R. F. D. tests last year, and he is probably responsible for the selection of these two cars for service at the exposition.

It is also worthy of note that a 4 hp. runabout sent to the exposition for use in the Post Office department exhibit was placed in temporary service between April 1 and April 25, conveying many tons of mail pouches over almost impassable roads between the exposition post office and the electric terminal at Pine Beach, a distance of about five miles. There were practically no roads in existence at that time, and what there were were in the course of construction, and the weather during April being abominable, it can be imagined that the little car in question, heavily loaded with mail sacks, had an almost impossible task to perform; but Mr. Barr has reported it went through it successfully and the car was placed in their exhibit on April 25, with a placard on it stating that it had performed the temporary service against almost unsurmountable obstacles.

CALIFORNIA MOTOR STAGE.—In this page is illustrated the 50-hp. motor stage shipped to A. H. Hayes, Jr., San Francisco, the California representative of the Oscar Lear Automobile Company. The machine is to be used in one of the counties north of San Francisco. It carries 18 passengers and has a compartment at the rear for 50 pounds of baggage per passenger. The front tires are 38 x 4 inch; the rear tires are 3-inch twins. The machine has four forward speeds, sliding gear transmission and an air-cooled motor with 5½-inch bore. The total weight of the machine is about 5,000 pounds. An order for fifteen more machines like this has been secured by Mr. Hayes.

COST OF OPERATING ENGINES.—Nearly one thousand requests have been received by the Maxwell-Briscoe Motor Company for copies of the report it has printed concerning the recent tests of their engines with gasoline, kerosene and alcohol as fuel. The report is exhaustive, many authorities on gas engines and mechanics being quoted. Fuel consumption, costs and mileage in the tests mentioned follow: Gasoline, per car mile, 1.9 cents; kerosene, 1.7 cents; alcohol,



Frayer-Miller 18-Passenger Bus.

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6 cents. Cost of fuel per ton mile—gasoline, 1.69 cents; kerosene, 1.39 cents; alcohol, 4.48 cents. Miles per gallon—gasoline, 10.1; kerosene, 7.4; alcohol, 6.13.

AN INDUSTRIAL ACHIEVEMENT REVIEWED.—A unique publication of great beauty, entitled "An Industrial Achievement," has just been issued from the press. It relates how, by what steps and along what avenues an enterprise, within a part of the life of one man, has grown from tentative operations conducted in one room on an upper floor of a building in Boston to a great industrial system, owning and operating numerous plants of international importance in five states.

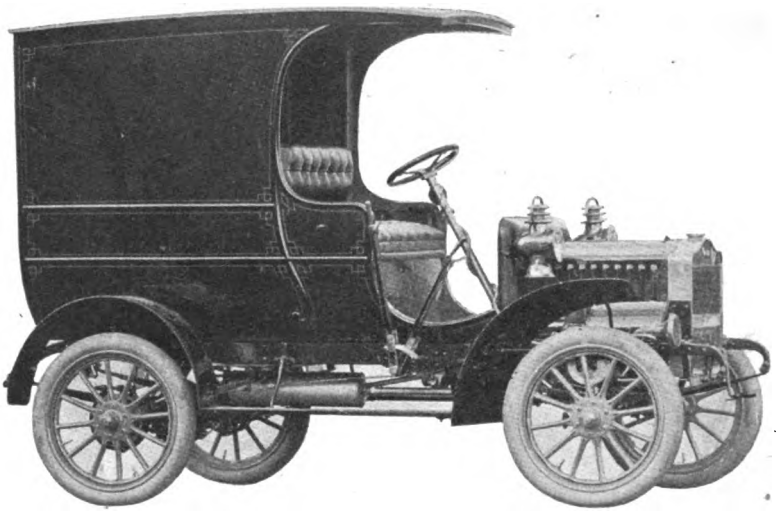
We all know the years of toil and thought and experiment it takes to reach anything like perfection in the manufacture of a newly-invented commodity, and as we see the result of those years of toil and study many questions spring naturally to the lips. It is in some degree to answer such questions with reference to the plants of the Pope Manufacturing Company that this book is published. It is intended as a milestone to mark the completion of an important stage in development, and it is also a record of the achievements of the company, a description of its *personnel*, the places in which its work is done, the manner in which it is done, the materials and methods used, and the character of the results obtained.

The company, as organized today, is a corporation with a capital of $22,500,000, operating in its own name the famous plant at Hartford, a factory at Westfield, Mass., and one at Haegerstown. It also owns all the stock of, finances and supervises, the Pope Motor Car Company, a subsidiary organization, which operates two factories, one at Toledo, and the other at Indianapolis. The same plan also applies to the operation of the Columbia Steel Company at Elyria, O., a separate organization, all of whose securities are held by the parent company.

In reviewing the organization the interesting fact is brought out that not only a majority of the officers and heads of departments have served the company for a period of fifteen years and upward, but many of the skilled men in the works have never known any other employer than the Pope industries.

Such technical matters as the selection of materials, the proper use of alloyed metals, and the complex problem of making such a delicately adjusted machine as a modern automobile, are discussed and described in such a way as to be easily comprehended by the layman and yet be of interest to those whose lives have been devoted to mechanical and manufacturing problems.

One chapter is devoted to each of the plants and mills, and, in point of fact, pictures have been used to such extent that they tell the story by themselves, and thus form a striking re-enforcement when taken in conjunction with the text.



Maxwell-Briscoe Gasoline Wagon in Service of Arnold, Constable & Co., N. Y. City.

A SEVERE TEST.—The following extracts from a letter written by a Canadian agent, handling Rapid motor wagons, throw a flood of light upon the behaviour of a one-ton vehicle when called upon to prove its merit under extraordinary conditions of service: "We wish to advise you of what we consider to be a most remarkable trial of the one-ton delivery car which arrived a few days ago. We left Calgary to make a trip of 130 miles. The roads for ten miles were perfect, and our load of six passengers, a trunk, and several valises was of no consequence. For the rest of the trip out we found the roads very muddy, several times up to the hubs. The wagon brought us through everything. It seemed impossible that any vehicle could pass through what we were up against. For six hours we wended our way through a blinding snowstorm. The only reinforcement we gave the vehicle was the wrapping of ⅝-inch rop on the wheels. We literally ploughed our way home. We had hills to climb which were so slippery that a horse, with the weight we were pulling, could not have stood. Without an involuntary stop we completed the whole trip. For a two-cylinder engine we do not believe it has its equal on the market, and we were requested by our expert mechanic to write this letter with the highest endorsements that could be expressed.—The Calgary Garage Co., Calgary, Ont., Canada."

NEW CARTER COMPANY'S PLANS.—At the first directors' meeting of the Carter International Automobile Manufacturing Co., held recently in Detroit, the following officers were elected for the ensuing year: Howard Carter, president; Louis Rosen, first vice-president; J. F. Crotty, second vice-president; J. E. Winney, treasurer; G. F. Dueweke, secretary; E. N. Slevin, assistant secretary; H. F. Koehler, general manager; Thomas MacColl and Edwin B. Chadman, directors.

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A. O. HENRY, Sales Manager

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See our Exhibit at Jamestown Exhibition and have a demonstration

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 32 JULY, 1907 No. 32

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WALTER WARDROP, EDITOR

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Team Owners in Difficulties

The High Cost of Operating Horses Makes it Necessary to Advance Cartage Rates

ALL who live out of the labor of horses, truckmen, team owners, cartage companies and others with like occupations, have for some time past been feeling the effects of dear animals, high wages, and the upward trend of prices for all kinds of draft animal supplies.

In Chicago matters have come to such a pass that operators declare nothing short of a stiff advance in service rates will enable them to make a profit on their investment. Their customers, however, rebel and on more than one occasion have suggested that if motor wagons were used instead of horses service would be much improved and its cost of maintenance greatly reduced. An advance in rates without a corresponding improvement in service is not relished by concerns who know how great are the advantages of motor wagon transport over animal haulage.

* *

In the "American Team Owner" we read the following pitiable confession which is at once an arraignment of city horse haulage and a powerful appeal for the general use of the motor wagon:

The controversy between the team owners and the public pertaining to the advance in price for cartage furnishes unmistakable evidence of the limited knowledge that the ordinary business man possesses as to the actual costs of maintaining a teaming business and the small compensation which the team owner receives.

The warnings which have been given in the past must be repeated to-day. Financially, the affairs of many team owners are going from bad to worse, the embarrassment of the year 1905 became poverty in the year 1906, and unless stringent measures of relief, in the form of better prices, be resorted to, the poverty of the year 1906 will become positive destitution in the year 1907. These are strong words and we would not resort to their use were we not absolutely convinced of the necessity of encouraging the team owner to maintain a just demand.

Every business man knows that business cannot be carried on satisfactorily unless a reasonable profit is realized, and once the trade is convinced that the advance in prices on the part of the teaming interests is not for the purpose of reaping a larger profit, but is for the purpose of enabling the team owners to derive reasonable compensation on their investment, there will be less friction and more harmony in the business.

In view of which fact, we cannot too strongly recommend a well-defined and organized campaign on the part of both the team owners' associations and the individual team owner to the end that each and every employer of teams shall have placed before them such printed matter as will remove all doubt as to the honesty and sincerity of the team owner in this move.

* * *

While those who have been intent upon the study of motor merchandise transportation have been well aware that of late all was not well in horse transportation circles, it was not suspected that the situation was such as to cause very great alarm, particularly as the competition of motor wagons, which is the greatest menace to horse haulage, has not as yet been developed to a degree which would justify its being pronounced immediately dangerous. It has escaped the notice of but a few, however, that within the past five or six years the cost of draft animals which are suitable for city traffic has been advancing steadily, until today prices are double what they were ten or fifteen year ago. What is more, useful horses for arduous city service are extremely scarce, breeders today practically receiving whatever price they may ask for them. It is also well known that the price of feed, labor, wagon materials, and even harness has been greatly advanced within the same period; and the worst of it is that the teaming industry is so old, and its practices so thoroughly refined, it is not possible to effect economy at any point without resorting to revolutionary methods. Innovation is abhorred by team owners. It is hard to teach them new tricks.

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Horses quoted as "poor to good," used for trucking, bring, according to the latest market quotations, from $110 to $115 apiece. Animals described as "good to best," intended for trucking, bring from $175 to $225. The latter are the prices which merchants who do their own trucking have to pay for their animals. Express and light wagon horses of the "best to good" variety are quoted all the way from $100 to $130, while the "good to best" grades of this class of stock are worth from $140 to $190 apiece. The poorest animals, therefore, which can be used in city transportation cannot be obtained for less than $100, while those in which a little speed and moderate endurance is required cost almost as much money as a truck horse. Even mules are expensive, teams of these inglorious brutes frequently bringing as much as $350.

* * *

In the last seven years the price of horses has increased almost 100 per cent. During the same period the increase in the cost of feed has varied from 60 to 100 per cent. Wagons, within the same time, have been advanced in cost about 50 per cent. Statistics show that the actual increase in the cost of horses for drafting purposes, within seven years, has increased exactly 112 per cent.

In mild extenuation of the advance in cartage rates the team owner urges his customers to consider that during all the recent years in which market prices have been against him, he has not attempted to make the public pay a rate for service commensurate with the heavier expense to which he has been subjected in the operation of his business. He lets it be understood that he has stood between the public and high prices, sacrificing his own interests in doing so. Maybe he did. But it is far more probable that, instead of doing anything of the kind, physical service conditions, which are carefully omitted from his bill of complaint, have been powerful in bringing about his present calamitous condition.

* * *

Every student of city transportation recognizes the menace which street congestion, due to the inferior speed of horse drawn vehicles, offers to the perpetuation of horse haulage. The useful labor of a horse in a crowded city is not today what it was ten or fifteen years ago. The animal covers less distance, and in the course of a year transports many tons less than when the cities were freer from vehicular obstruction. Furthermore, the inadequate terminal railway facilities, which are growing worse in large cities under the constant increase of commerce, deprives team owners of the service of their horses and drivers for many hours in the course of a week which heretofore they were accustomed to occupy with profitable activity.

It is within the power of the railway transportation companies to deal with the team owner and make his business profitable or otherwise. Take the difference between given cities in the practice of delivering freight. In one city the railroad delivers goods at the freight house door; in another the driver must go into the freight house, sort over its contents, and perhaps emerge with less than half his rightful load. Again, in one city the freight is ready for delivery almost immediately on its arrival; in another city insufficient terminals, insufficient railroad agents, or other equally vexatious causes, hold back the goods for days after their arrival in town. The remedy for this condition of affairs is of quite as much importance to merchants as to team owners.

It is a fact, nevertheless, that many wagon hours which are now wasted at freight stations would, if motor vehicles were employed and permitted to operate within the depots, be converted into work hours for delivery.

* *

If team owners and truckmen were not so much affected by the traditionary practices of their calling they would, in the present emergency, look around to see if it were possible to discover some means for preserving their business without advancing rates. They are not wholly unfamiliar with the principles which justify the employment of the motor wagon. They have heard of its economy, but find difficulty in giving credence to it. In convention at New York a year ago the national body of team owners declared itself hostile to the employment of power wagons. The machines were said to be costly, expensive to maintain and unreliable. There are about 8,000 industrial motor vehicles in use in this country at the present moment, and familiarity with many of the installations convinces us that the vast majority of them are profitably engaged in work. The team owner's prejudice prevents him from knowing this. A few more lean years will bring him to his senses.

NINETY MILE MOTOR STAGE LINE

WORD comes from Silver City, N. M., that the isolated Mogollon mining district will soon be connected with that point by motor stage. The present horse stage line is inadequate to care for the volume of business offered it. Indeed so poor is the service that only extreme necessity will force passengers to make the 90-mile trip.

The Mogollon Motor Road Company, capital stock $50,000, has been formed for the purpose of remedying this state of affairs. It will build a toll line between the points named, work having already commenced. The building of the road will involve the erection of a substantial bridge across the Gila. The new company will absorb the stage and express business of C. W. Marriott and the Ernestine Mining company. It is the intention to put on motor cars to handle all the express and passenger traffic to and from the Mogollon district, as soon as the bridge across the Gila is completed. Pending the completion of the toll road the present public road will be used.

The Board of Education in New York City has authorized the expenditure of $4,700 for the purchase of a motor truck to transport school supplies.

For nearly a month a London garage company has been running a regular daily service of passenger cars from the English capital to Paris, the cars being transported across the English channel on steamers. The entire trip is made by daylight.

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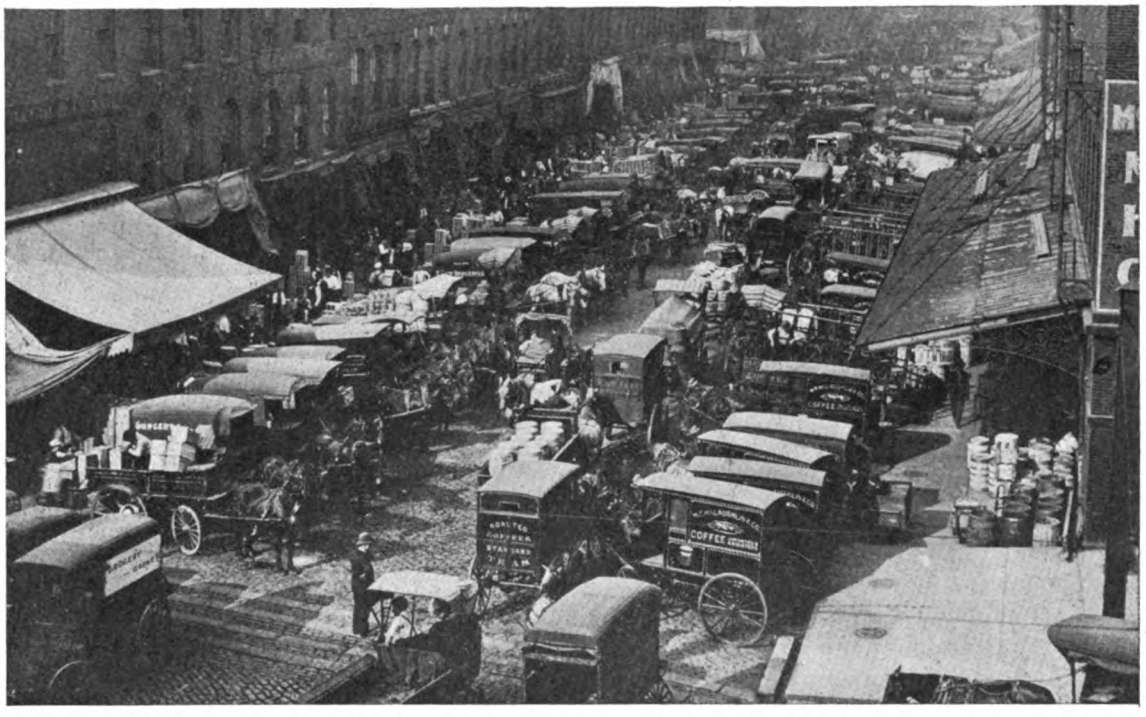

The Most Congested Thoroughfare in America—South Water Street in Chicago.

City Transportation Losses

Millions Lost Every Year as a Result of Traffic Congestion Which Motor Wagons Could Relieve

DELAYED street traffic in large cities, due to the congestion arising from the employment of horses in merchandise transportation, is endured at an expense which amazes even those who are accustomed to look for losses wherever draft animals are extensively used.

Of the many talented investigators who have undertaken to ascertain how great is the loss thus caused, none has dared to estimate it at less than $10,000,000 annually for London, $8,000,000 for New York, $5,000,000 for Chicago, and correspondingly large sums for other commercial centers of the first magnitude. Not a few consider these estimates ridiculously low if all losses properly chargeable to delayed traffic are taken into account. Every interruption to commerce, however trivial it may seem to those who are not affected by it, exerts an influence which it is difficult to define or measure. It is certain, however, that the world pays fully as much for idle business hours as for periods of activity.

* * *

Now while it would not be very encouraging to consider the employment of motor wagons if their highest or only use consisted of an ability to facilitate street travel by relieving its congestion, there can be no doubt that, possessing this advantage, their other superior attributes assume all the more prominence. If an increase in a city's commerce is to be attended by a congestion of its merchandise street traffic, horses being the agents in transportation, it becomes of the greatest importance to know if the same volume of traffic cannot be more expeditiously and economically moved using compact power vehicles which occupy one-half the room taken up by animals and their wagons. It is also pertinent for taxpayers to inquire how much might be annually saved if, instead of widening, maintaining and repairing streets in order to make them suitable for crowded draft animal transportation, the bulk of city haulage was performed by motor vehicles.

* * *

On this page is shown a view of the most congested thoroughfare in the world—South Water street, Chicago's great commission market—which is in the condition depicted above from four o'clock in the morning until six o'clock in the evening every business day in the year. Along its entire length of eight blocks some 3,000 horse drawn wagons stand backed up to the curbstone waiting to be filled from the stores of provisions which the merchants have stacked head high both in warehouse and on the street. Approximately 17,000 tons of merchandise is hauled through this street daily, representing in value close to $20,000,000. Merchants sell out their stock four or five times a day. Between the double line of wagons, backed up against the curb on either side of the street, is a thin line through which loaded and unloaded wagons make their way with difficulty. It is estimated that 10,000 teams pass the corner of South Water street and Fifth avenue every week day, the great majority of them emerging from the commission market district.

The extraordinary congestion in this part of Chicago will never be remedied unless motor vehicles are used as substitutes for horse-drawn wagons, or unless, as has been timidly proposed and savagely condemned, a number of subsidiary commission markets are established throughout the city and a certain amount of the produce now handled on the street is sold direct from cars in the freight yards.

The commission merchant does not seem particularly alarmed about the traffic congestion which prevails in his district. It is the producer who suffers most from the

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crowded condition of the market thoroughfare. Loads of perishable freight often depreciate twenty-five and fifty dollars in value through delay in reaching the commission merchant, or in being removed from his care. The retailer is also a sufferer, since his effort to buy perishable provisions at as early an hour in the morning as possible, and get them to his distant store before they spoil is not always attended with success. He is furthermore put to the inconvenience and expense of having wagons and animals profitlessly inactive for many hours of the day when their labor might be made highly useful in other parts of the city.

* * *

Probably the source of greatest loss to the team owners in a large city is the congested condition of its streets. Traffic regulations, rigorously enforced, undoubtedly eases the congestion. But no legislation can diminish the space which horses and wagons occupy or augment their speed. Permanent relief can only be obtained by the substitution of motor wagons for draft animal transportation—a substitution which not only economizes in room, but in numbers, three horse-drawn wagons and their teams usually retiring in favor of one power wagon. In New York all drivers of heavy and slow-moving vehicles are directed to keep to certain streets and follow in regular order, not being allowed to pass each other. They must remain between the curb and car tracks between 8:30 a. m. and 6:30 p. m. The executive committee of the Commercial Association of Chicago thinks it has found a satisfactory plan to operate in that city. It is proposed to have all the coal used within the loop district delivered at night, or at least after the rush hours of street traffic. The crowds of vehicles and pedestrians in the shopping streets is rapidly approaching the danger point. As the city grows the street traffic will grow and some way must be found to reduce the number of wagons devoted to retail business.

A considerable portion of the central commercial district of Chicago is now tunneled for the passage of freight cars. Establishments which are in receipt of large daily shipments of merchandise find it a convenience to have freight delivered at their buildings from the tunnel tracks without incurring the expense of cartage and many handlings. The big bulk of merchants within the district served by the tunnel company, however, are denied the advantages of tunnel freighting since their incoming shipments are not heavy. It is plain, therefore, considering city merchandise transportation in the large, that underground freighting will not appreciably lighten surface street traffic.

* * *

The proposal to eliminate coal wagons from the streets within the loop district during business hours is put forward as a measure of expediency rather than as which are heavy and slow, block and check traffic by using which are heavy and slow, block and slow traffic by using the street car tracks. Admitting the truth of the accusation, it would seem that the occupancy of the street car tracks by heavily loaded wagons is only made desirable on account of the wretched condition of the adjoining street pavements. Anyone who has even casually examined the pavements in the down town districts of Chicago will readily absolve coal wagon teamsters from the misdemeanor of which the enemies of traffic congestion accuse them.

If the coal merchants of Chicago employed motor wagons instead of horses it would not be necessary to consider the use of the night for delivery within the loop district. It is not from willful choice that the drivers of such wagons use the street car tracks.. Loads of coal drawn by horses vary in Chicago from three to six tons within the district mentioned. The speed at which these loads are transported is not greater than 2 miles an hour, if so much. Using motor wagons, the loads transported would be equal, the speeds would be doubled or trebled, and while there might be the same temptation to use the street car tracks as now exists it is undeniable that the superior mechanical construction of motor wagons would permit freer use of the pavements such as they are. It is the constant tugging in the shafts which exhausts the horse on pavements which are not well maintained. A horse has stored in him a given number of foot pounds energy. If he wastes his strength in overcoming street inequalities his daily service decreases. It is different with the motor wagon. It can always replenish its energy.

* * *

The scientific regulation of street traffic is a matter which has received very little attention at the hands of merchants or municipal authorities. Such study as has been given it does not take into account the fact that city street transportation is undergoing radical changes. Practically all thought upon the subject has been confined to the consideration of the horse as the sole agent in city merchandise transportation. The horse gives us bad streets and dirty ones, and slow, congested, expensive and uneconomical traffic both to team owners and the public at large. In the knowledge that modern science makes available it should be possible to conduct traffic with safety, celerity, without congestion, with the minimum of expense or effort to the traffic itself, and with the minimum of burden to the taxpayer. This, however, cannot be done until the large proportion of city merchandise is moved by means of motor vehicles. Congestion rarely arises from the fact that a larger number of vehicles is proceeding along the street than the street is physically able to accommodate. It is more frequently the case that a line of vehicles is retarded by some slow-moving vehicles at the head of the procession, the vehicles in the rear being unable to overtake it on account of other vehicles moving in the opposite direction. Where streams of traffic cross each other there is likely to be much congestion, particularly if there are any vehicles in the neighborhood which are not active. Always in a study of congested street traffic one is impressed with the fact that horses take up fully as much room as the wagons which they pull.

It would seem open to conclusion, therefore, that the surest and most economical way to avoid city traffic congestion is to get along without the animals which do so much to produce such a condition.

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Buses for Philadelphia

Motor Bus Traffic is Authorized by City Authorities and will Commence Immediately

AFTER a campaign of education which lasted almost two years electric buses are to operate in Philadelphia. On May 23 the Select Council passed the measure permitting motor bus traffic, and as the mayor has already signified his approval of it the bill will become effective without delay.

With the intention of securing governmental patronage for its enterprise the Auto Transit Company, formed to operate on Broad street and other thoroughfares, is now in communication with the postal department, endeavoring to obtain the contract to carry mails now transported by the street cars. This company hopes to commence operations on July 15. It confidently expects to be granted the right to instal collection boxes on its new vehicles to receive letters that might be dropped in them by passengers. The plan as outlined to the postal authorities at Washington is to have the boxes emptied on each trip at Broad street station, where there is a mail chute system by means of which the letters collected on the buses could be rushed to the central office for distribution if their destination so required; otherwise they would be distributed from the Broad street station or the Reading terminal. This system of collecting the mail is in use in London, and is said to be growing in favor.

The date fixed for the inauguration of the bus passenger service was chosen in order to meet the rush of traffic during the Elks' convention.

Twenty-five omnibuses will constitute the equipment in the beginning. More vehicles will be added to this number until the service, as projected, will be completed, that is, until there are sufficient buses to maintain a perfect schedule between League Island Park and the Widener Memorial Home. At first the route will be from 33d street and Ridge avenue to Diamond street, to Broad street, to Spruce street and return. A three-minute headway is figured on at certain hours, and it is promised that a bus "will always be in sight" when the service is perfected. Even in the beginning the company maintains that it will fulfill expectations in the matter of speed and the distance between buses.

One of the advantages claimed for the buses is that they will not be delayed by fire or traffic blockades, except as long as it would require to make detours over other streets and return to Broad street beyond the place where there was interference. Moreover, it is asserted that a full bus will not be held behind a bus that is empty, but if in its progress the full one reaches the one ahead it will still maintain its rate of speed. The company insists that its chief aim will be to give the people the best service.

Though the hours when the buses are to be run have not been decided on, it is promised that the beginning and the end of the day will be considered from the standpoint of the greatest good to the greatest number.

"We will run the buses later than midnight," says Manager Hill, "but how much later we have not decided. We will take care of the special occasions always, and theatergoers will find that we will not neglect them."

"No seat, no fare," is the rule under which the company will operate. The fare will be five cents straight. "When a bus is full it is full," explained Mr. Hill, "and that means that when 34 passengers are aboard there will be no more taken on until that number is lessened. In other words, straphangers will be strangers on the buses."

Passengers will be discharged at the curbs and not in the middle of the street. The conductors and motormen, as the drivers will be known, will be allowed to use their judgment as to whether stops shall be made at one or either or both sides of intersecting streets. Eventually rules may be promulgated on this point by the company. The maximum speed of the vehicles is given as 12 miles an hour .

The power of the Auto Transit Company's buses is fixed in each of the four wheels. The general appearance of the vehicles is very similar to those used in London. They are 18 feet long, 5 feet 6 inches wide, and 6 feet high on the inside. On the roof there are seats for 18 persons and the motorman, and inside provision is made to seat 16. Lap robes for comfort in winter and rubber robes as protection from rain in other seasons will be provided for the roof passengers.

All four wheels of the buses being driven the vehicles do not skid. A general description of the mechanism of the machines was contained in the December issue of this paper.

A garage 128 by 169 feet is being erected at Thirty-first and Nevada streets for the Auto Transit Company. In addition to this building, a two-story power station, 82 by 167 feet, is being constructed at Thirty-first and Dauphin streets. The cost of the two buildings will be $40,000.

OVER 900 MOTOR BUSES IN LONDON

AT the last census taken it was found that 913 motor buses were being operated in London by the following concerns:

Vanguard Motor Bus Co.	317
London General Omnibus Co.	173
London Road Car Co.	170
London Power Omnibus Co.	63
Great Eastern Motor Omnibus Co.	50
Thomas Tilling	33
Associated Omnibus Co.	29
Star Omnibus Co.	24
Birch Bros.	15
Miscellaneous Owners	39
Total	913

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Tiffany & Co.'s Model Garage

Well Equipped Stable of Firm Which Relies Exclusively Upon Motor Wagon Service

UNUSUAL care was expended both by architects and principals in order to make Tiffany & Company's electric wagon garage the most artistic and practicable building of its kind in the country. It houses twenty-one delivery wagons, each with rated capacity of 1,000 pounds, and two 2-ton trucks.

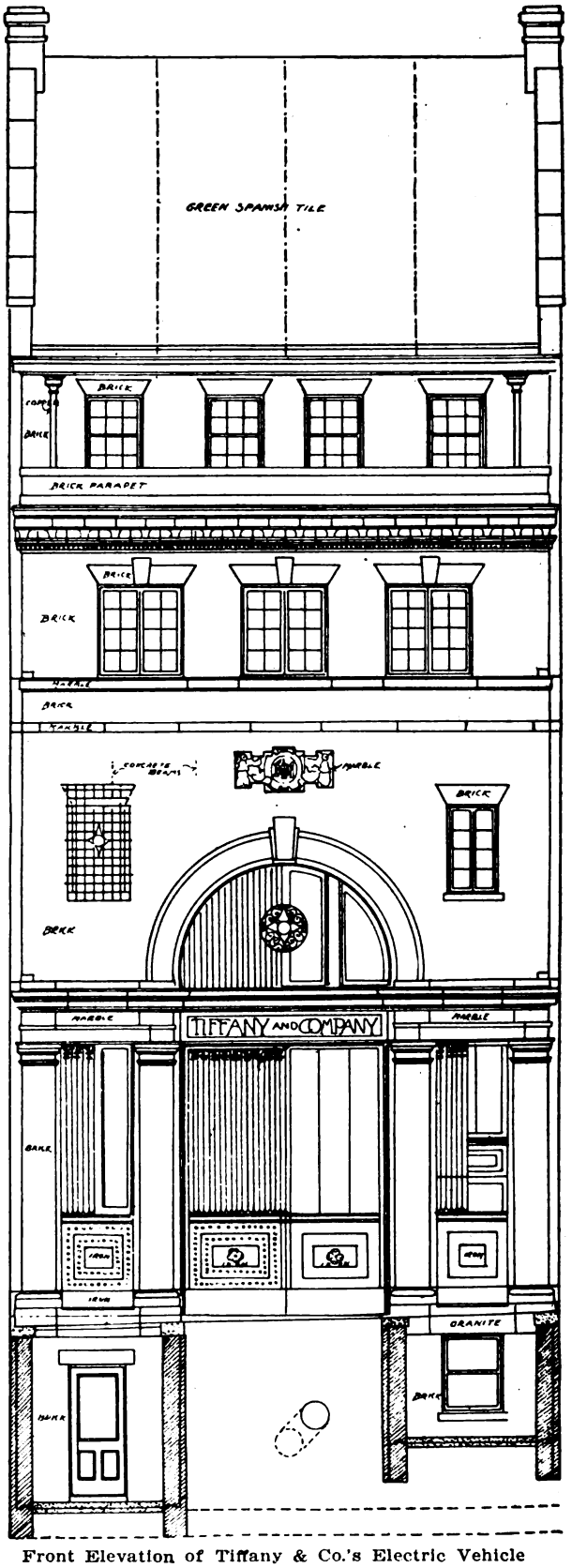
The early experience of this well-known jewelry house with industrial motor vehicles did not fail to establish the importance of exercising thorough executive control over its mechanical transport department. Having so much merchandise to move each day, and so many wagons assigned for such duty, constancy and activity of operation was necessary if an approach to maximum economy was to be reached. Close supervision of the service, therefore, became the first and highest law. And this is now satisfactorily accomplished by quartering the transportation superintendent and his family in seven rooms on the top floor of the garage, where he is easily accessible to all who may need his advice or aid in moments of emergency. The direct result of this well planned strategy is that 95 per cent of the wagons are always ready for work, while upon occasions when extraordinary service is required all of them are available.

As all of Tiffany's road transportation is now performed by motor wagons, the horses and wagons having been discarded in 1905, it is of the utmost importance that there shall be no idle hours during the period of daily service. So thorough is the organization, so perfect its control, and so well administered are the machines, that from Saturday night at 9 o'clock to 6 a. m. on Monday—a period of time usually occupied by other establishments in frantic endeavors to repair the ravages of a week's work—the garage is closed and not a single workman is to be found on its floors. The whole institution is run with clocklike precision and every possible trouble anticipated.

* * *

The garage stands on a 40 x 90 foot lot at 140 East 41st street, in New York City, three minutes running time distant from the Murray Hill establishment. It has four floors and a basement, with elevator communication from top to bottom. In the basement is a coal bin, boiler room, elevator machinery, water distilling apparatus, electric service panel with switches for distributing current to each floor of the building, a work bench, a portable forge and an engine lathe for making minor repairs. The distilling plant supplies water for the batteries, having a capacity of one gallon an hour. A machinist and a helper work in the basement. No spare batteries are kept. All repair work is done in the basement, wagons needing attention being let down from the street level on the elevator.

On the first floor is a switchboard, six charging stations, washing stands and circular overhead hydrant attached to the ceiling. The second and third floors are similarly equipped, but each has ten charging stations. The superintendent's living apartments are in the front of the top floor. Part of this story is used for storing ma-



Front Elevation of Tiffany & Co.'s Electric Vehicle Garage, Including Basement.

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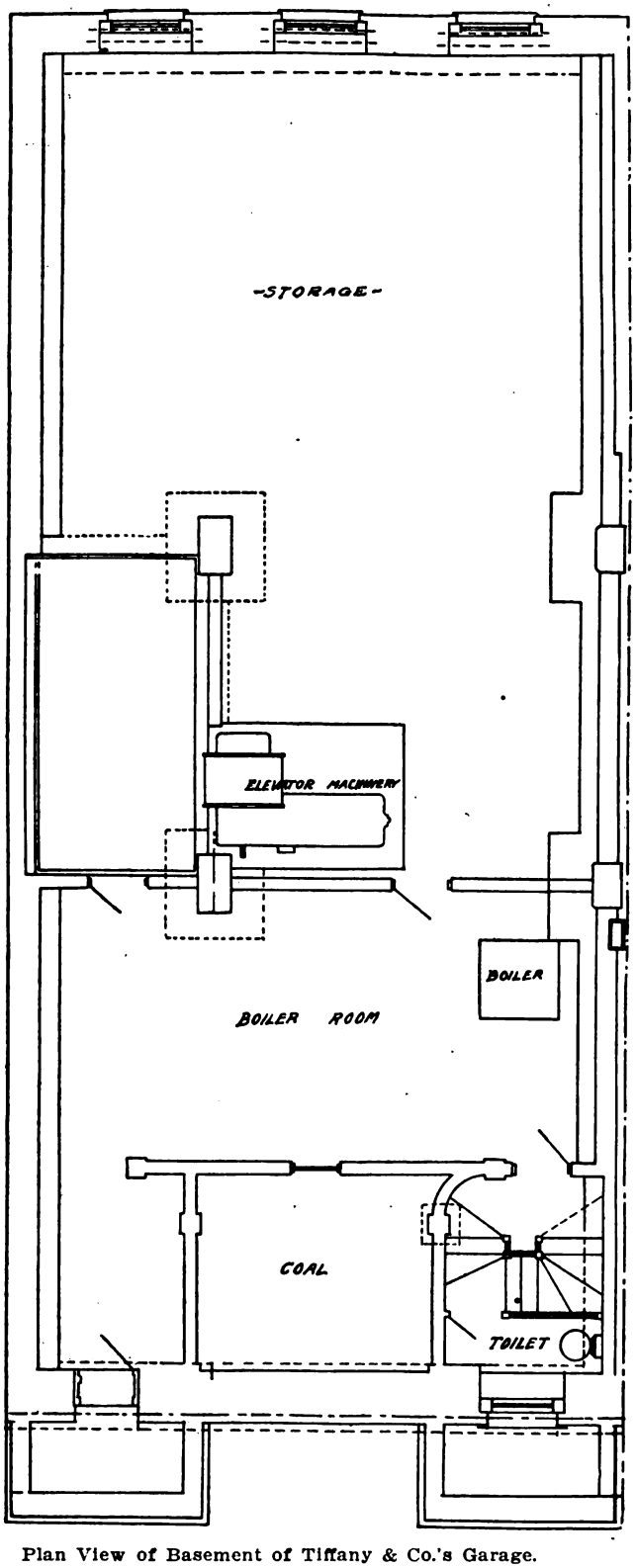
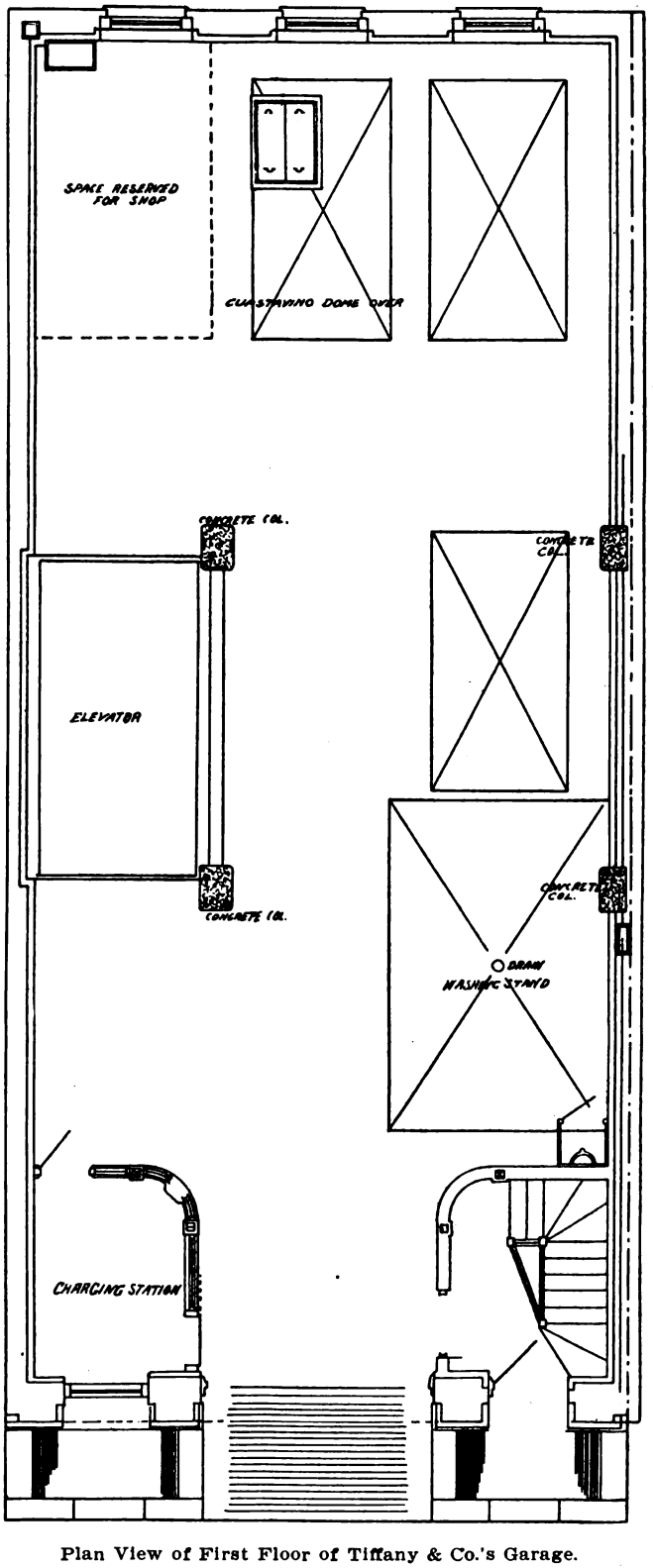
terials. There is room in the garage for seven more wagons than are now employed, or thirty in all.

* * *

It has often been stated in this paper that in the sense that it can transport merchandise more cheaply than horses the economy of the motor wagon has been demonstrated any time within the past five years. To those who only recently have had occasion to be curious concerning the reason for this economy such a statement doubtless appears rash, perhaps even unworthy of credence. The history of the Tiffany installation, however, abundantly confirms its accuracy, as it reveals gradual and, therefore, justifiable investment since the fall of 1902, at which time the company employed fourteen horse-drawn wagons and twenty-two horses. The maintenance of this draft animal equipment was costly, the service it afforded was inferior, stable room was not adequate, and the business of the company was growing—all conditions which favored the introduction of the motor wagon. Three machines were constructed from designs supplied by Tiffany & Company,



Plan View of Basement of Tiffany & Co.'s Garage.



Plan View of First Floor of Tiffany & Co.'s Garage.

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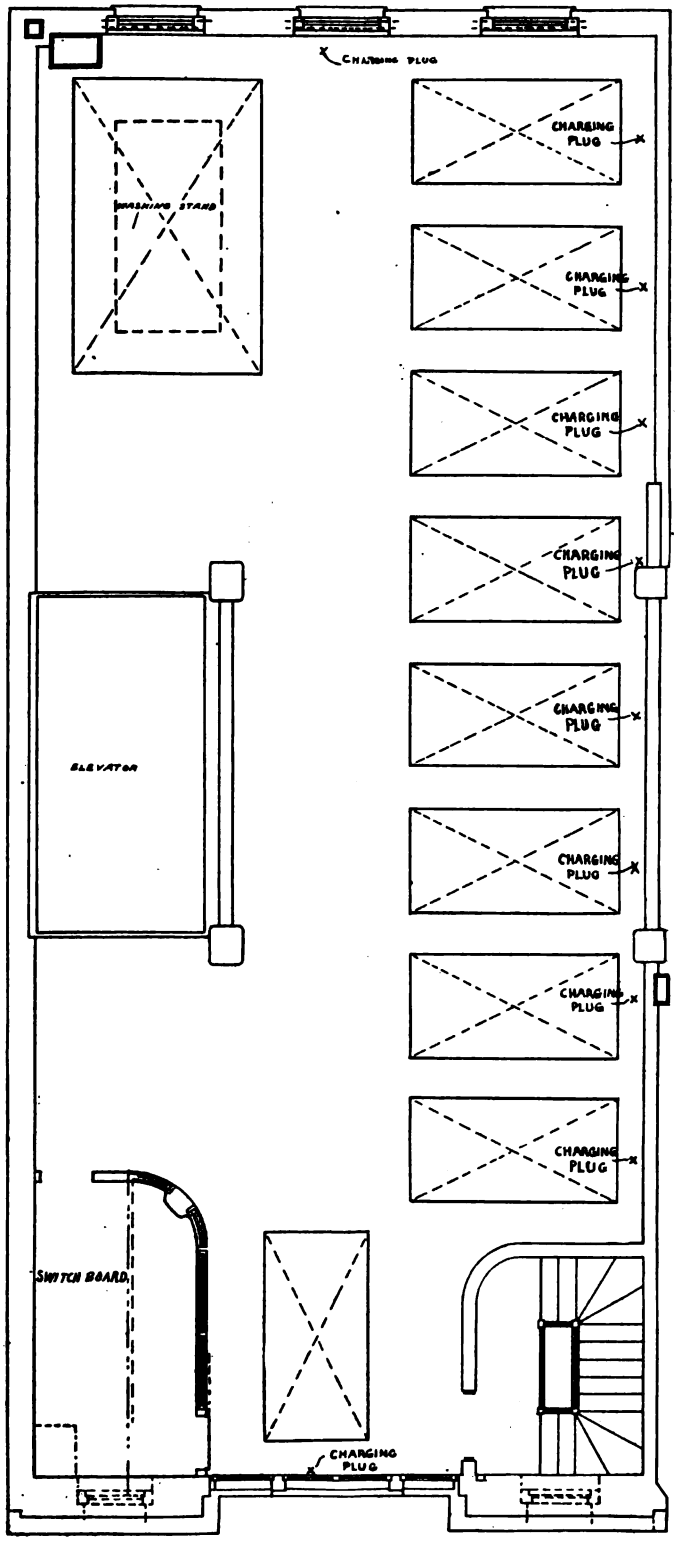
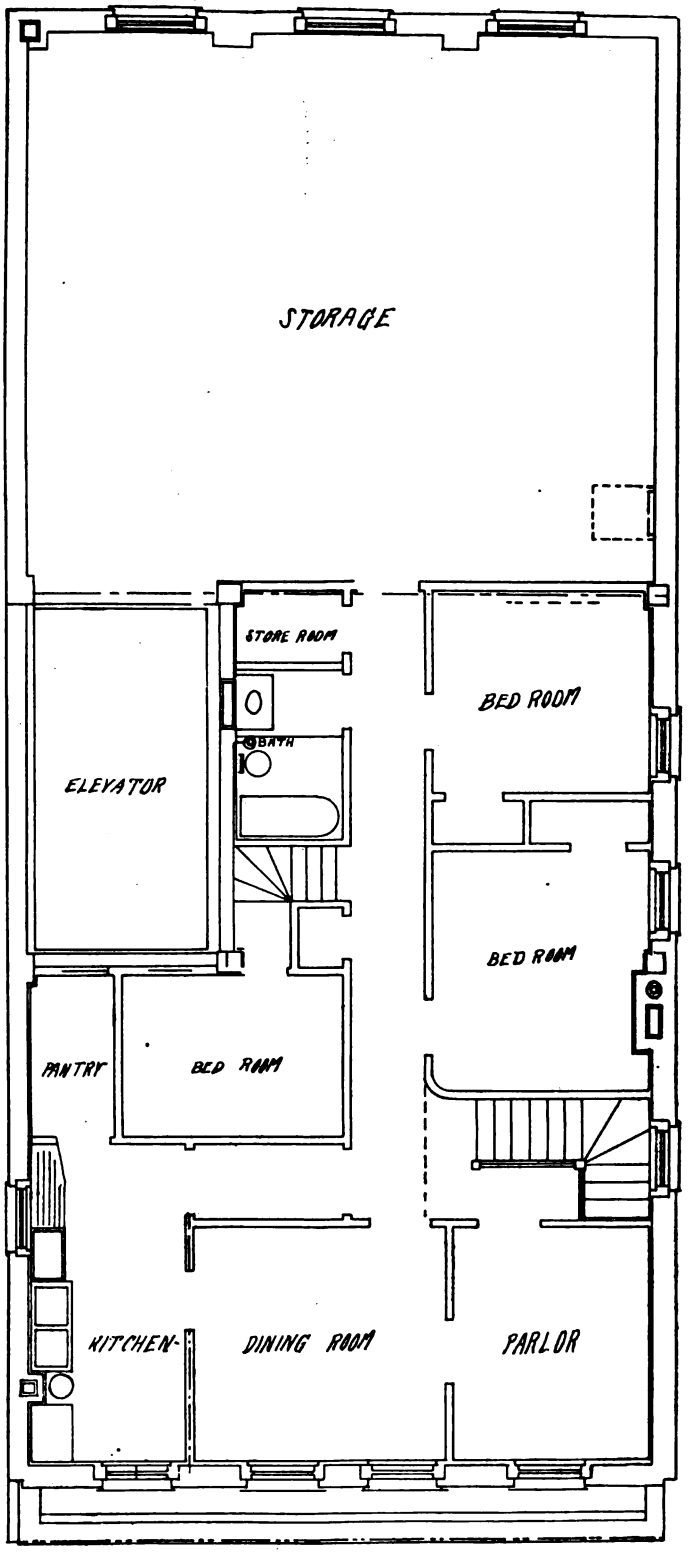


Plan View of Second Floor of Tiffany & Co's Garage; The Plan of the Third Floor is Similar to This.



Plan View of the Top Floor of Tiffany & Co's Garage, Showing Transportation Foreman's Living Quarters.

two of which have a rated capacity of half a ton and the other rated at two tons. These three wagons are still in service, and from the beginning gave such a good account of themselves that in 1904 seven more light wagons were bought. Still the firm continued to use horses. In 1905 seven more electric wagons were purchased, and in 1906 four more. When the company was operating 17 electric wagons it decided to get along without horses and rely exclusively upon mechanical transport. By that time it had realized that the saving effected by operating a few electrics could be largely increased by a total substitution.

* * *

Tiffany & Company were pioneers. There is no pioneering to be done today. There is no longer any risk attending the employment of motor wagons. All the vital problems of successful operation have been worked out by Tiffany & Co. and others who for five years past have had experience with the modern industrial motor road vehicle. It only remains for the mass of horse users to properly

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apply the machine, intelligently care for it, and it is inevitable that it should reward whatever investment may be necessary in order to have it replace draft animal transportation.

* * *

The Tiffany wagons average about 25 miles a day at a speed of 8 or 10 miles an hour. They are nicely rated for the work they perform. Built to carry 1,000 pounds, and take care of an overload, they actually haul about 500 pounds of merchandise on the average and the weight of two operatives, the driver and his helper. The tires with which they are equipped give good service, one set of 3-inch solids lasting about two years. Chain grips are attached to tires when traction is hard to secure, as in freshly fallen snow. At other times chains are not employed. The tires of one of the 2-ton trucks have only been replaced once since 1902. Motors are inspected daily. Batteries are watched very closely. Repairs are very light, consisting chiefly of brush renewals, commutator and armature corrections.

* * *

Tiffany's motor wagon drivers are a very superior lot of men. All men in middle life, sober, intelligent and industrious. They work from 8 to 12 hours daily, according to the exigencies of the business.

* * *

The Tiffany garage was designed by McKim, Mead & White, one of New York's leading architectural firms.

NOT AFFECTED BY THE STRIKE

DURING the recent strike among the piano handlers in Chicago it was noticeable that Lyon & Healy and The Cable Piano Company, both of which concerns employ motor trucks, were completely immune.

Speaking of the value of motor trucks in piano delivery service the president of the Lyon & Healy company says: "If we did not find them practicable and economical we would not continue to use them. One of our trucks starts with a load of four pianos and delivers them in from two to three hours, according as the journey is short or long. To deliver the same number of instruments by horse-drawn wagons would require the service of two two-horse vehicles and the time consumed in making the journey and unloading would be fully half a day. We save the expense of a crew of movers, a team and wagon, and not only perform the work more quickly but better. Until we began to use motor trucks our delivery was considerably interfered with. It is now all that we could desire."

Another Chicago piano dealing firm says: "When we all have motor trucks and clean, strong able-bodied men to handle our instruments, the delivery trouble will disappear, but not before that time."

The fire department of Frederick, Md., is to be supplied with a motor driven fire engine and hose wagon, the first motor fire vehicle in the state.

MOTOR CAB RATE WAR IN NEW YORK

IT is unfortunate that, before a single gasoline motor cab is plying for hire in New York City, there should be talk of a rate war between the two companies which aim to operate there. In the absence of any trustworthy information concerning actual cost of operation and administration it is absurd to introduce highly competitive methods which, as a rule, are held in reserve till there is extraordinary occasion for their use. It is easier to start trouble than to quell it.

Interested and well-balanced onlookers of the efforts being made to furnish the metropolis with gasoline cab service are not inclined to applaud the rivalry which animates both the American Cab Company and the Motor Carriage Company. Both lack experience in the extremely difficult work of conducting a public vehicle service upon a modern basis. Their first duty to the public is to give an efficient service. Cheap rates do not guarantee good maintenance. At the outset the volume of public support which may be expected for both enterprises will be determined by the excellence of the service, not the cheapness of it.

Officials of the American Cab Company say their rates will be five cents for an eighth of a mile for two persons, or forty cents a mile. This is ten cents less than the fare fixed by city ordinance. For three or four persons an additional half fare will be asked, making the rate sixty cents a mile for four passengers, whereas the legal rate for four would be $2.

DRIVEN TO USE MOTOR WAGONS

OUT in Omaha the postal authorities are encountering trouble in transporting mail between the main and sub-stations owing to the refusal of the street railway company to carry sacks at the low rate authorized by the government. The local postmaster, therefore, is confronted with the choice of employing either horse-drawn wagons or motor wagons. He hopes for the latter, but may have to put up with the inferiorities of the former.

The street railway company has notified the government that it does not care to have the contract for hauling the mail from the main postoffice to the sub-stations or to South Omaha. The company receives but three cents a mile for this service, no matter what the amount of mail. Sometimes the mail from South Omaha will occupy over half the front vestibule, and for transporting this the company has been receiving but 15 cents. The distance from the Omaha postoffice to the stations is just a mile and for hauling the mail the company has been receiving 3 cents a trip. For this they have to carry several sacks of mail, the registered sack, and a man to go with the registered sack.

In South Dakota a large grain ranch is operated entirely without horses. Plowing, harrowing, seeding, harvesting, threshing and hauling is accomplished by means of motors.

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Penny Wise, Pound Foolish

St. Louis Fire Chief Admits Superiority of Motor Apparatus, But Will Not Urge Its Purchase

DID the taxpayers of St. Louis possess half as much knowledge concerning the superior economy and efficiency of self-propelled fire apparatus as the city's fire chief professes to have, they would be sorely puzzled to understand why he lauds such equipment but declines to recommend its purchase.

The chief is evidently something of a trimmer and desires to stand well with both the progressiveness and the reactionaries. While he flatters the former by declaring that within a few years motor fire vehicles will have replaced the apparatus now drawn by horses, being cheaper to maintain and decidedly more efficient in action, he manages to keep the latter in good humor by deploring the expense of such equipment. Such trifling is inexcusable in an executive of a municipal department which is maintained upon the theory that heavy loss of life and property will inevitably occur if the service is not kept constantly at the very highest pitch of efficiency.

The real or fancied opinions of the chief are supposed to be contained in the following cryptic utterances:

In a few years automobile fire-fighting machines will take the place of apparatus now drawn by horses. Cheaper maintenance and greater speed are the two characteristics which will be the cause of apparatus driven by motive power succeeding the horse. I have not recommended the installation of automobile apparatus because it is so expensive and the city is growing so fast that we have all we can do at present to keep up ample fire protection under the present apparatus.

The initial cost of substituting motor power for horseflesh would be very great, but I am sure it would be much cheaper in the end. Some pieces of apparatus going only short distances to fires will travel not more than 100 miles in a year, but the horses to pull them must be well fed and cared for at a great expense. This same piece of apparatus equipped with motive power would cost only a fraction of that of the horse-drawn vehicle in the expense of operation. If a hose wagon has to be drawn a long distance to a fire, as is sometimes the case, the horses become fagged, and there is consequently some delay in getting to the fire. A machine would make the same speed the entire distance.

* * *

It is impossible to believe that the inhabitants of St. Louis do not greatly desire a more superior form of life and property protection than the present service affords, particularly when it is well known that it can be more cheaply maintained. That the installation of such a superior service should be somewhat more expensive than the installation of the inferior service it replaces need not excite surprise, for it is the rule of business life that merit shall always command a higher price than mediocrity.

Anxious to placate the civic statesmen who can see value in no improvement unless its cost is microscopical, the fire chief urges as excuse for not recommending the purchase of motor apparatus the fact that the city is growing and that it is, therefore, necessary to husband the resources of the treasury. As the growth of a city is largely dependent upon the fire protection which it is afforded, it is manifest that such objection should carry no weight. It would seem that a city which is constantly acquiring wealth and population should on that very account anticipate the strain to which its fire fighting equipment may be subjected. Obviously it would be bad judgment to buy more horse-drawn apparatus, for upon the fire chief's own confession it is inferior at all points to motor apparatus. There logically remains, then, nothing to do but recommend the purchase of the latter and effect, as other cities propose, annually such a saving as will within a period of years utterly wipe out the investment.

Perhaps the fire chief of St. Louis can tell us how long it will take to write off an investment in horse-drawn apparatus. Horses in fire service represent waste in administration. Their employment cannot be justified either upon the score of economy or usefulness, and yet these are the only elements in fire department service about which taxpayers care a fig. Again there is occasion for reminding readers that wherever motor fire vehicles are being employed in considerable numbers it is the expectation that they will earn the cost of their installation within 10 years.

* * *

The growth of St. Louis, to which its fire chief so plaintively alludes, far from furnishing an excuse for not bettering the fire service, in reality seems to beg for its improvement. As territorial expansion is the most obvious characteristic of a city's growth, the distance to the scene of many a conflagration naturally becomes greater and greater until in the end the range of fire service is so extended as to make the employment of horses seem farcical. The number of instances in which horse-drawn apparatus reaches the scene of a fire half an hour after the apparatus might be made useful is known to everybody.

* * *

The attempt to make it appear that extraordinary expense would attend the substitution of motive power for horses is very wisely abandoned after baldly presenting the idea. Substitution does not mean that the present inefficient horse equipment is to be maintained after the motor equipment has been installed. As replacement occurs horses and obsolete vehicles can be sold, and the proceeds applied to the purchase of new and modern equipment. The reduction in wages and general operating expenses would, from the moment the motor vehicles were installed, still further increase the gain and eventually cause the original outlay to be recovered. But even if these advantages were not to be secured the purchase of motor fire apparatus would still be warranted by its superiority to horse apparatus. The finances of a city can never be so poor that appropriation cannot be made for the better protection of human life and property.

The postmaster of Columbus, Ohio, has been authorized by the postal department to make use of automobiles in collecting mails. Service will commence July 1.

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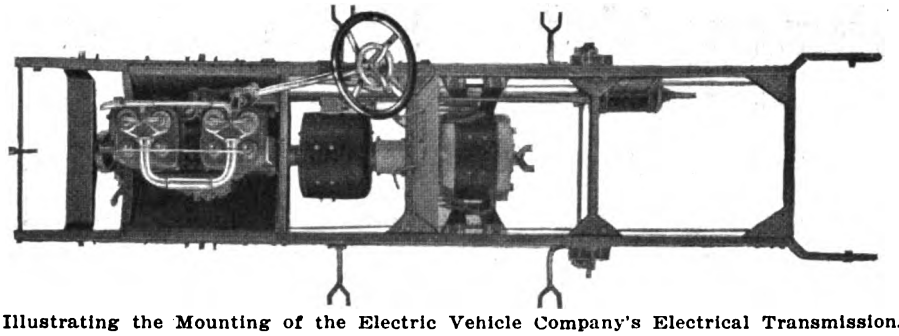


Illustrating the Mounting of the Electric Vehicle Company's Electrical Transmission.

Gasoline Electric Transmission

When Applied to Heavy Public Service Passenger Vehicles Its Merit Becomes Evident

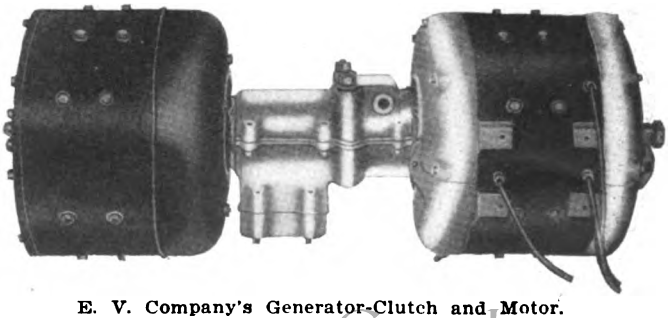
ALTHOUGH many experimental gasoline-electric motor vehicles have been made and introduced to public notice they cannot yet be considered as representing a permanent type of construction. The straight gasoline and the straight electric machines are so well entrenched in public favor, and are so economical in all but the most exceptional service, that it is unlikely the mixed type will for sometime to come command more than passing attention from engineers or motor wagon users. The ease, silence and simplicity of operation are features of the gasoline-electric vehicle which cause it to appeal powerfully to those interested in public motor car service like, say, the operation of buses in London. Some idea of the severity of such service may be gained from knowing that the vehicles are on an average required to stop six times in a mile and change speeds nine times within the same distance. This plays havoc with change speed gears in vehicles which are called upon to travel 115 miles a day, necessitating 690 stops and 1035 changes of speed.

Other advantages possessed by a well designed electric transmission are: Reduced tire wear and the abolition of the gears, clutch, speed control lever, reversing lever and other parts. It is inferred from experiments that the efficiency of electric transmission is higher than wheel gearing; at full load it amounts to 80 per cent. In the matter of weight electric transmission is at a disadvantage, being heavier than gear wheel transmission.

* * *

In the car made by the Electric Vehicle Company, of Hartford, Conn., the system of transmission and control is purely electric, the gasoline engine being the sole source of power. The field of an electric generator is bolted directly to the 45 hp. engine, taking the place of the ordinary fly-wheel. The other end of the field is carried in a large ball bearing. The armature of this revolving field generator is enclosed within the field, and its shaft is extended through to the driving bevel in the rear axle housing, which contains the bevel gear drive and the differential, these being the only gears in the machine.

In line with the revolving field generator, and behind it, is an electric motor whose armature is mounted upon the same driving shaft, which extends from the armature of the revolving field generator to the driving pinion. The revolving field generator serves the purpose of a clutch and, by maintenance of current in its field and armature circuits, transmits the full driving effort exerted by the engine directly to the driving pinion, there being no loss of driving effort, as any friction between the armature and field would to that extent transmit a part of the driving effort in the same manner that a friction clutch does. It is necessary, however, to have a small speed difference between the armature and field in order to establish the necessary current through the low resistance of the generator armature and field, which is short-circuited upon itself. This causes a continuous slip, of an amount depending upon the driving effort developed by the engine. This slip, however, only amounts to 5 per cent of the engine speed when the engine is running at 1,000 r. p. m. and developing its maximum torque. To this extent this revolving field generator acts as a friction clutch capable of transmitting continuously and uniformly, without wear, the full driving effort of the engine. Such a clutch, however, although infinitely superior in its method of control to an ordinary friction clutch, would not provide means for more than reducing the speed of the vehicle in relation to the engine speed, and would not in itself provide means for multiplying the driving effort delivered to the wheels to more than that established by the fixed ratio between engine and wheels. A multiplication of this driving effort, however, is secured by including in the circuit of the revolving field generator, the motor, which is mounted upon the same driving shaft. The current which it is necessary to establish in the field and armature of the generator to transmit the engine torque, can still be established with the motor in circuit and it will still deliver the driving effort of the engine to the



E. V. Company's Generator-Clutch and Motor.

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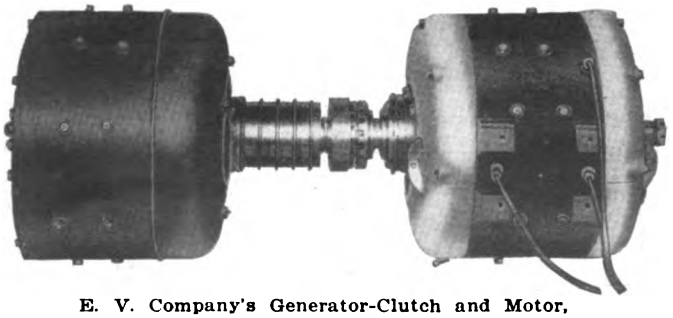
driving shaft without loss; but an increased slip takes place which, instead of appearing as heat as in the case of a slipping friction clutch, appears as electrical energy, and this electrical energy is utilized in the motor to give the desired added driving effort over and above that of the engine as transmitted by the revolving field generator.

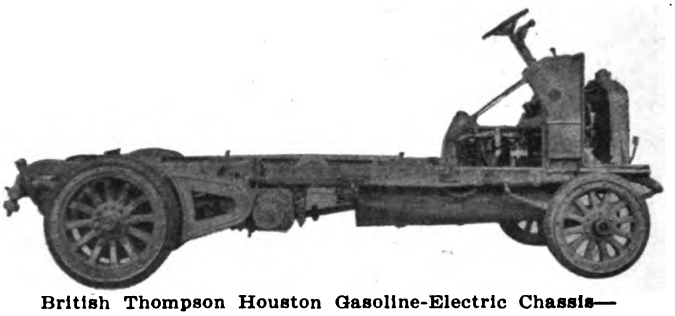
All changes of speed are made by a small controller handle, similar to that of an electric car, which has five speeds ahead and two reverse speeds, and provides means for putting the two armature windings which the motor has in different series parallel relation, and also provides means for shunting both the field of the motor and the generator for desired speed combinations. The result is that the driving effort of the engine can be multiplied very greatly, and the maximum effort capable of being developed by this combination can be made available continuously even with the car at a standstill, as the revolving field generator forms a clutch which may be slipped continuously and uniformly, and which will deliver the result of its slippage as useful power instead of heat. The control involves absolutely no change in the mechanical relation between the engine and the rear axle, and in going from point to point does not disconnect the driving effort of the engine from the driving pinion. Only the power represented by the difference of speed or slip between the field and armature is transformed.

The capacity of the electrical clutch generator and motor in this system is about four times greater than it would be with a generator and motor considered simply as such; that is, they will transmit and control the power of the engine with one quarter of the weight and far greater efficiency than would be the case if all the power of the engine was used to drive a generator which in turn delivered it to the motor to be transformed into mechanical energy. The result is that actually less than 10 per cent more weight is added to the vehicle than would be called for if it were equipped with sliding gear transmission, clutch and fly-wheel. The efficiency of transmission is very high, being 95 per cent on the high speed, and from 85 per cent to 92 per cent on the lower speeds.

Reversing is accomplished without the use of gears by clutching fast the armature in the revolving field generator, and at the same time disconnecting it from the driving shaft leading to the rear axle. In this way the revolving field generator loses its clutch action and becomes simply a generator, stationary armature and revolving field. The motor, whose armature is still connected with



E. V. Company's Generator-Clutch and Motor, Showing Collector Rings.



British Thompson Houston Gasoline-Electric Chassis—By Courtesy of "Motor Traction."

the driving shaft, receives current from this generator and drives the car either forward or backward, according to the relation of its field and armature connection. Under these conditions the system is simply a motor dynamo combination, but as reversing is only necessary for short distances at low speeds, this is amply sufficient, and is much simpler mechanically than the use of a reversing gear, although the latter may be used when it is desired, as in railway service, to have equal capacity and efficiency for running in either direction.

In connection with the control an electric brake is provided, and there is also a connection between one of the foot brakes and a small short-circuiting switch, by means of which the field of the generator is short circuited when the brake is applied. This immediately stops generation and answers exactly the same purpose as throwing out the friction clutch on an ordinary car upon the application of the brake; so that, to bring the car to a standstill, it is only necessary to put on the brake.

It should be noted that in order to establish any current in the circuit of the generator it is necessary that there should be a slight slip between the field and the armature; in other words, the engine should run slightly faster than the driving shaft to which the armature is connected. With the engine slowed down by a partial closing of the throttle, there is no clutching action and the car may coast ahead of the engine without any retarding effort, and in this way the combination acts exactly similar to a coaster brake on a bicycle. This adds greatly to the ease of control and allows driving and coasting in perfect silence, entirely free of any connection with the intermittent driving or braking effort of the engine. It also permits regaining speed and headway much more rapidly than would be possible with the ordinary gasoline car, because as the engine is speeded up again by opening the throttle, it attains a speed some little higher than the speed of the car before it starts generating and picks up its load. Although this interval of time is but a fraction of a second, the speed gained in that time and the elastic method of clutching to the load, coupled with the great inertia of the fly-wheel (which is of about three times the ordinary weight), permit a very high rate of acceleration under load.

As there is no direct mechanical connection between the engine and the driving shaft, and as the clutching medium is perfectly elastic, there is absolutely none of the intermittent driving effort of the engine transmitted to the driving shaft and wheels; also that it is impossible for the engine to have a retarding effort upon the driving

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shaft. There can be absolutely no "bucking" from the loss of a cylinder. The most expert factory testers find it difficult to detect the cutting out of a cylinder except through the diminution of available power. The propelling effort is apparently just as even and constant with three out of four cylinders running as with all four.

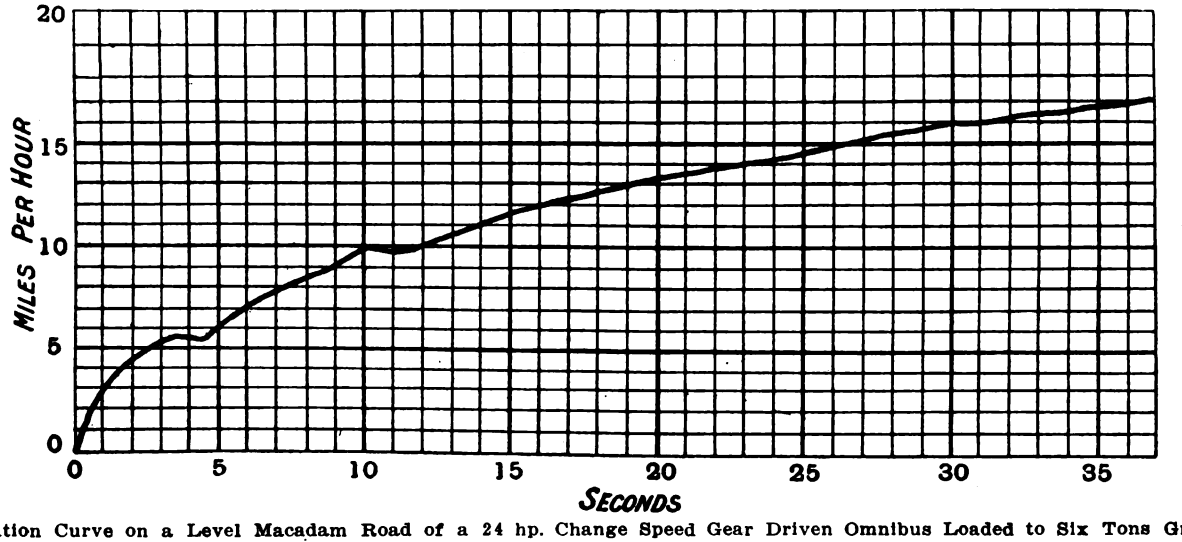
On all points of the controller, both zero, forward and reverse, the circuit of the electric motor is closed upon itself. The result of this is that, being a series motor, it has no tendency to generate when armature and field are coupled in a relation for the desired direction of motion of the car, but if for any reason the driving effort from the engine should be lost, as by stalling on a grade, the instant the car commences to run backward the motor will generate and act as a brake, not permitting of a speed of more than one mile an hour even upon a very steep incline.

* * *

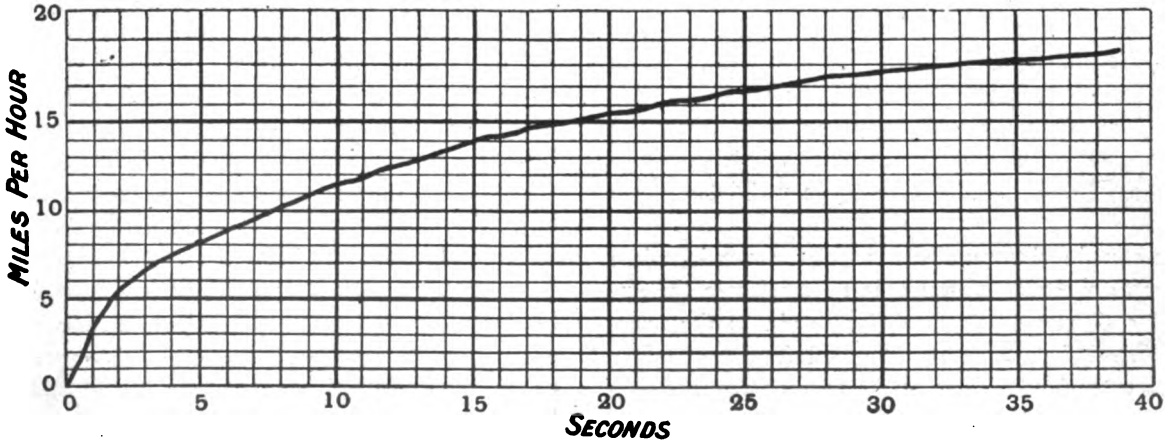
The electric transmission system just brought out by the British Thomson Houston Company consists briefly of a dynamo driven by a gasoline engine, the whole of the engine power being converted by the dynamo into electrical energy, which is transmitted through a controller to two motors driving the road wheels. The dynamo is coupled direct to the engine, the armature replacing the flywheel. In order to ensure rigid alignment, the dynamo frame is bolted to an extension of the engine crank chamber case, the whole forming a compact unit. Two motors are provided, each driving a road wheel independently, the differential gear thus being eliminated. The dynamo is designed to maintain a constant load at a constant speed of the engine, irrespective of the varying load demands of the vehicle.

Each motor is rated 7½ k. w., constant input 130/65 volts, 1400/500 r. p. m. They are series wound, and are totally enclosed with removable aluminum covers. Tests have demonstrated that they are capable of propelling a vehicle having a gross weight of 7 tons up grades exceeding 14 per cent without injurious heating or sparking.

The system of control is simple and reliable. To the right of the driver is the "operating box," which is coupled through a chain to the controller proper. The latter is close to the motors and generator, thus reducing the length of the connecting cables to a minimum. The controller provides the following motor connections: 1st, speed forward—motors in series; 2nd, speed forward—motors in parallel; an "off" position; reverse—motors in series. In the "operating box" is mounted a small resistance and control switch, which is connected in circuit with the generator field. A foot pedal is arranged to be coupled to both the engine governor and to the control switch in such a manner that when the pedal is fully



Acceleration Curve on a Level Macadam Road of a 24 hp. Change Speed Gear Driven Omnibus Loaded to Six Tons Gross—By Courtesy of "Motor Traction."



Acceleration Curve on a Level Macadam Road of a 24 hp. Omnibus Fitted With the B. T. H. Gasoline-Electric Equipment, and Loaded to Six Tons Gross.

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depressed the engine is governed to run at 400 r. p. m., and at the same time the switch is moved to insert the resistance in the generator field, which is sufficient to reduce the main volts to practically zero. No current, therefore, flows through the motors, and the vehicle is stopped. On releasing the pedal the first movement cuts the resistance out of the generator field, causing sufficient current to flow to the motors to start the vehicle, which will continue to run slowly, the engine remaining governed at 400 r. p. m. On entirely releasing the pedal the governor is "held up," allowing the engine speed to at once increase to its normal 850 r. p. m., and the vehicle will accelerate to its full speed. The engine speed is prevented from exceeding 850 r. p. m. by the restraining influence of the generator, which exerts for all conditions of load a limited but definite load demand.

In order that the electric motors may exert the necessary additional torque in ascending a grade, they will require an increased current. The generator automatically supplies this increase of current, but at a proportionally lower voltage. Thus the torque load on the engine, and therefore its speed, remains unaffected, whatever the grade may be and this is brought about without any hand regulation on the part of the driver.

It should be observed that in this method of control no main resistances are used to regulate the vehicle speed, there is, therefore, no energy wasted in such resistances. The field resistance mentioned is quite small, and under no condition absorbs more than ¼ per cent of the power of the engine, and during normal running is cut out of circuit altogether. An additional feature of the B. T. H. control is the stopping and re-starting of the vehicle without operating the controller, and therefore without breaking the main circuit, thereby eliminating any possibility of sparking at the controller contacts. The vehicle is started with the motors in parallel, i. e., with full speed connection. The controller is only operated for reversing and in climbing grades exceeding 5 per cent, when better results may be obtained by running on the first forward series position, but, on the other hand, no damage can occur to the equipment if the driver neglects to change the speed.

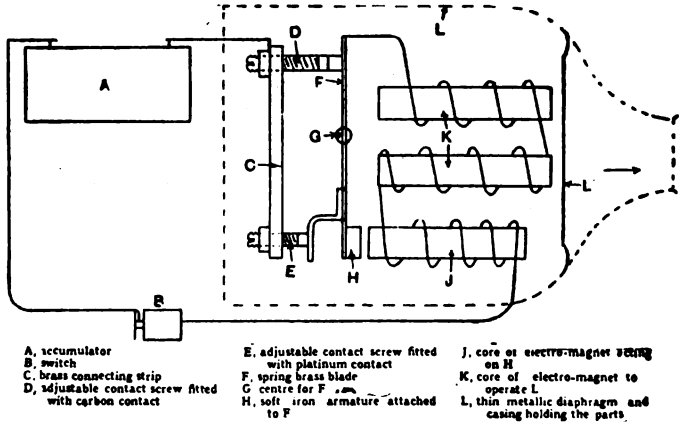
A feature in the control which tends to fuel economy is the arrangement whereby the driver is obliged to reduce the speed of the engine to 400 r. p. m. when the vehicle is standing, thus preventing the practice of racing the engine with the vehicle stationary. In cases where it is necessary to travel for long distances at reduced but constant speeds, and it is not convenient to regulate by the foot pedal, a hand lever is provided, which independently controls the engine speed and allows the pedal to be released.

Under certain circumstances, as, for example, when climbing steep grades, it is desirable to accelerate the engine speed for short periods, in order to obtain the maximum power available. This is provided for by coupling the hand lever to the field switch in correct sequence, in such a manner that, after the hand lever has been moved to a position corresponding to normal engine speed of, say, 850 r. p. m., a further movement inserts a portion of the field resistance, which changes the load demand of the generator and permits the engine to increase in speed, delivering to the generator, and thus through the motors to the road wheels, its maximum available h. p. By this means full advantage can be taken of the additional h. p. that may be obtained by running the petrol engine for short periods above normal speed.

The maintenance of this electric transmission is practically confined to brush renewals.

ELECTRIC SIGNAL HORN

AFTER listening to the raucous cry of the reed, the tintinnabulation of the bell and the voice of the siren whistle, we are now to pay heed to the rich diapason of the electric horn which can be heard 800 yards away and is said to be as soothing as it is penetrative. Its cadence is produced by the following means: When the switch B completes the circuit with the accumulator A current passes



A, accumulator
B, switch
C, brass connecting strip
D, adjustable contact screw fitted with carbon contact
E, adjustable contact screw fitted with platinum contact
F, spring brass blade
G centre for F
H, soft iron armature attached to F
J, core on electro-magnet fitting on H
K, core of electro-magnet to operate L
L, thin metallic diaphragm and casing holding the parts

to the brass piece C by means of the wire shown. This piece carries at one end an adjustment screw D fitted with a carbon contact piece. At the other end is an adjusting screw E fitted with a platinum-pointed tip. Normally the blade F has contact with both D and E. The blade is mounted upon the insulated center G, and has at one end the piece H, which is a soft iron armature. The current passing through the contact points of E and along the blade F and through the windings round the soft iron pieces K and J, causes them to act as electro magnets. The pole piece of J attracts H, and breaks the circuit at E. In doing so the contact between the carbon piece attached to D and the blade F is varied in intensity, and according as this intensity of contact varies the current passing from the battery round the circuit is likewise varied. In the course of this action, however, the electro magnets K act upon the diaphragm L in the same manner as in the telephone diaphragm, with the result that a series of oscillations or disturbances are set up. These cause quite a loud buzzing noise even when no trumpet is attached, but when one is fitted, as indicated by the dotted line, the noise is extraordinarily penetrative.

A company has been formed to put 250 motor cabs on the streets of Manchester, England. Another company intends to operate 100 vehicles.

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Heavy Duty Tires

Sectional and Other Forms of Construction Which are Calculated to Lighten Maintenance Expense

ONLY those who habitually fail to perceive the relationship existing between cause and effect grumble at the high cost and perishable nature of solid rubber tires. People who use motor wagons with an intelligent appreciation of their economy, and are not confused over the means employed to obtain it, know that the vehicles earn their right to a place in commerce as much by the character of their present day wheel equipment as by the ingenuity of their propelling mechanism. The everlasting tire, which can be purchased at very low cost, has not yet been invented.

It is important always to remember that the industrial motor vehicle achieves success in spite of as well as on account of its solid rubber tire equipment. If the cost of wheel equipment is high it must be borne in mind that it is not so high as to imperil the vehicle's economy. Besides, if no such protection was afforded to wheels the cost of machinery upkeep would be vastly greater than it is at present and the service record of the vehicles would be much less satisfactory.

Of necessity there must be one item in every maintenance account which is larger than the others. Tire upkeep is the chief item of expense in power wagon maintenance. But while it is laudable to desire improvements which will constantly reduce this charge, it is absurd to quarrel with it because in the accounting it happens to be the largest item in the list. Expense is not necessarily, or even frequently, synonymous with loss. It costs plenty of money to equip motor vehicles with rubber tires, but the expense represents the cheapest insurance which can be written on the life of the machines.

Rubber tires overcome rolling friction and husband power. Equip a motor vehicle with steel or iron tires and compare the power expended in driving it over unequal road surfaces with the power required to propel the same vehicle rubber shod. Compare also the effects of general wear and tear. It will at once become evident that the rubber tire makes mechanical road traction practicable.

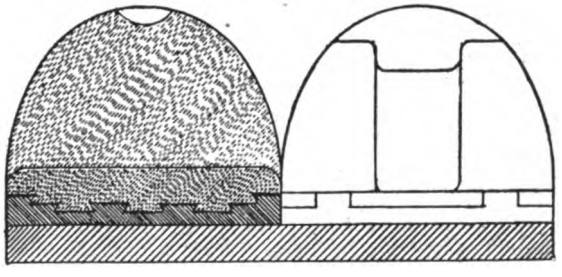
The use of steel tires, which is so ardently desired by people who are only superficially informed concerning the value and functions of a rubber tire, does not commend itself to automobile engineers except in cases where the crushing load is too great to be supported by any other material. The unyielding, unaccommodating steel shod wheel drops into every road and street hollow and is raised out of them by the wasteful expenditure of power. The rubber shod wheel, on the contrary, bites the worst surfaces and greatly facilitates motion. It is indeed a poor surface that will not afford traction for a rubber tire, which has the advantage of expanding in the direction of motion as well as the capacity to increase its face area under pressure.

As a shock absorber the solid rubber tire, when aided by suitable springing, stands pre-eminent, being far superior to the pneumatic tire. Shocks are really absorbed to a certain degree in a solid tire.

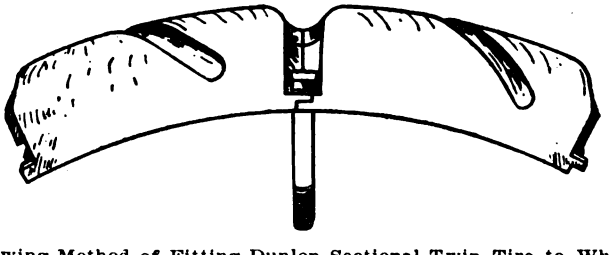
Resistance to traction is independent of tire surface on roads of average condition. In other words rolling resistance is not affected by tire width on such roads. On roads devoid of foundation and always soft, however, it is advantageous to increase tire width.

Twin, and even triple, tires are now in common use where heavy loads have to be transported. Some twin tires are made with a double tread for each tire, and thus each wheel has four treads. All multiple tire construction

Dunlop Sectional Twin Tire.



Dunlop Sectional Twin Tire.



Showing Method of Fitting Dunlop Sectional Twin Tire to Wheel.

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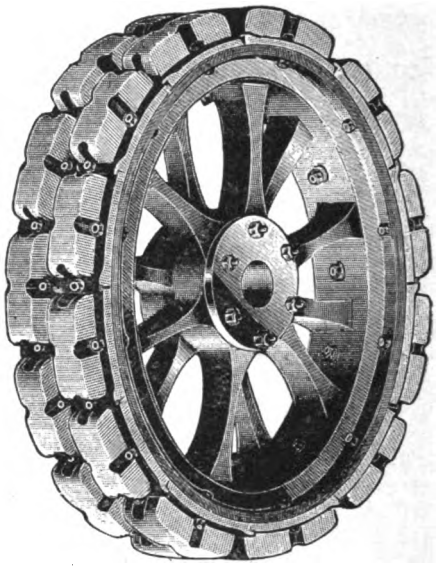
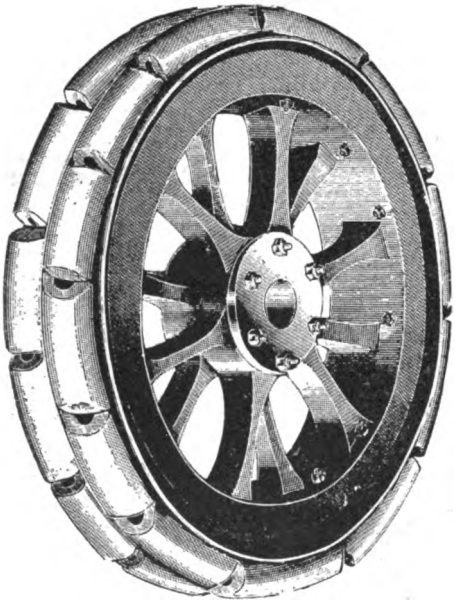
Triple Block Tire for Motor Buses and Heavy Wagons.

Another Dunlop Pattern Designed to Overcome Sideslip.

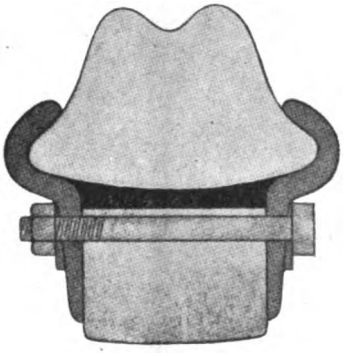


Twin Block Tire for Motor Buses.



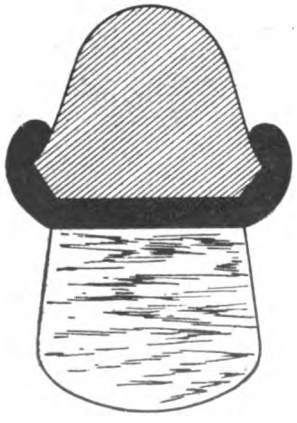
Clincher Grid Twin Tire.

Section of Dunlop Tire.

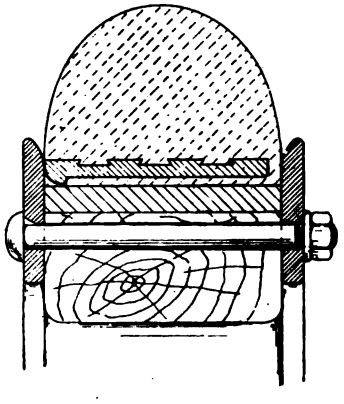


The Hopkinson Tire.

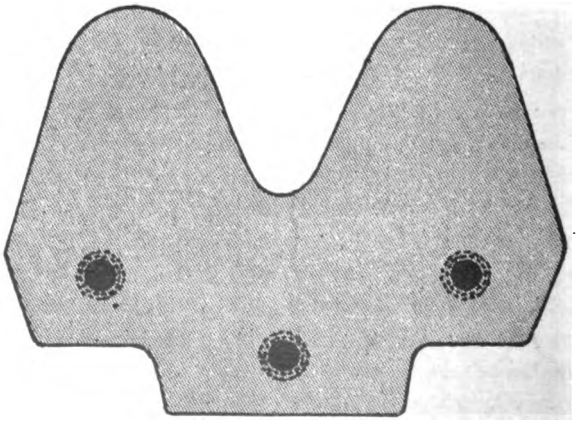
Clincher Block Arrowhead Tire.



Sirdar Tire.



Continental Tire.



Twin Tire With Common Base of Solid Rubber.

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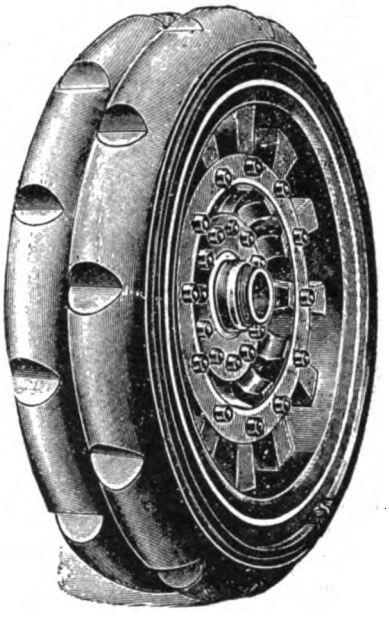
affords a large base with a small tread, while reducing rolling resistance.

Rolling resistance is still further reduced by making the single, twin and triple tires sectional instead of continuous, the sections being placed at right angles or diagonal to the wheels, and care being exercised in order that the ends of adjoining sections shall not come in contact with the road surface at the same time during the revolution of the wheel. The spacing of the sections is an important matter. If they are too far apart the tire will bump and cause loss of tractive power. Sectional tires are justly popular with motor wagon users, as they miss many road obstacles that continuous tires have to swallow. The sectional tire also swallows deeper on the edges of the sections than in the center of the faces, due to the rubber at the edges being more compressible. Hence the sectional tire is more resilient than the continuous tire. Indeed, the more the sections the greater the resiliency, and the more is the tendency to side-slip restrained.

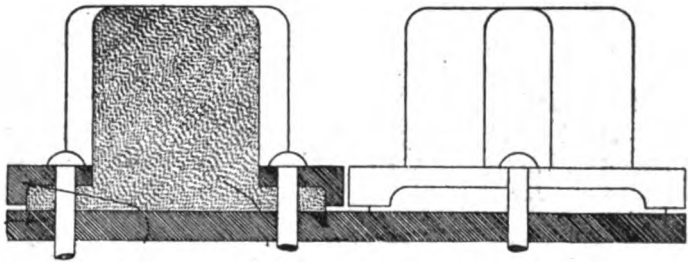
It will be interesting to study some of the sectional and other forms of solid rubber tires which are commonly employed on industrial motor vehicles. As we borrowed the twin tire from European inventors, and have been somewhat tardy in applying it, it is not surprising that recent developments in this class of construction should have their origin abroad. The motor bus industry has greatly stimulated the inventiveness of foreign tire makers, in fact has given birth to it. The great weight which the tires of these vehicles have to sustain calls into play every resource known to manufacturers, and as a result we have as many forms of tire construction as there are forms of vehicles. For the illustrations and text descriptions of the designs presented we are indebted to our contemporaries, the Industrial Motor Vehicle and Motor Traction.

The Dunlop sectional twin solid tire is composed of a series of rubber sections built on to sections of steel band. The surface of this band presents the appearance, when viewed endways, of one side of a shallow dovetail joint, and the rubber is secured to the metal by vulcanisation. The steel supporting pieces extend beyond the rubber at each end, and are shaped to fit over one another in the manner of a half-and-half joint. They are thus secured at each end by two bolts, which are driven through to the inside of the felloe and carry suitable nuts. This allows a damaged or worn section to be very easily removed, by undoing four bolts and pulling one end of the section up and along in the direction of its length. Sections may thus be replaced singly. In removing a section there is no need to loosen any of the side flange bolts. The sectional construction undoubtedly tends towards the abolition of side-slip, and this property of the tire is still further accentuated by the deep diagonal grooves formed in the surface of each section.

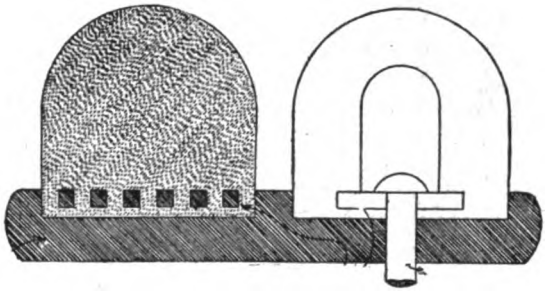
The Clincher grid and Clincher block tires are composed of separate rubber blocks, fixed securely to the wheel rim. The separation of the blocks is said to prevent overheating. The stress is reduced to a minimum by the division of the mass of rubber into separate blocks, allowing the heat generated to get away by radiation and con-



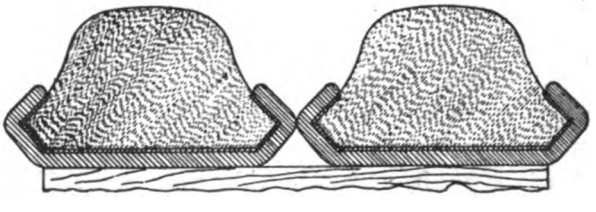
Modification of Block Tire.



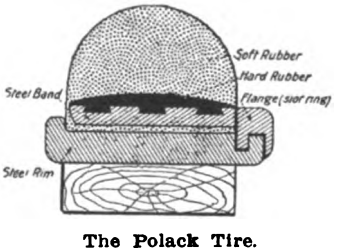
Clincher Block Tire.



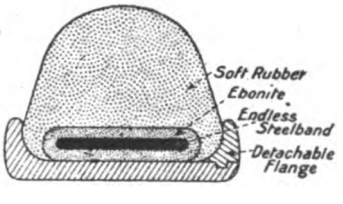
Clincher Grid Tire.



The Sirdar Twin Tire.



The Polack Tire.



Peter Union Tire.

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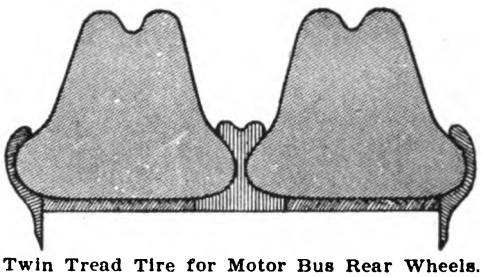
duction. The arrangement of the blocks in two parallel rows with the spaces between the ends of any two sections in the same row, opposite the centers of the adjacent section in the other row, is a side-slip preventive. Any block damaged or worn can be replaced in the space of two or three minutes at comparatively little cost.

The Continental tire (which is endless) is vulcanized on to a steel band having dovetail grooves cut round the circumference, and is fitted to a flat steel rim that is shrunk on to the wooden felloe in the ordinary way. Upon this steel rim there is a projection or key which exactly fits into a groove cut across the inner side of the tire. This prevents the tire creeping or slipping round the rim. After the tire is pressed on the steel rim hydraulically, flanges are bolted on each side of the felloe, the bolts passing right through, and the flanges are drawn up tight by screwing up the nuts. The flanges stand up a very little way above the base of the tire, so that the whole of the rubber is utilized in absorbing shocks from the road, and it is possible to run until the rubber has so worn down that there is very little waste.

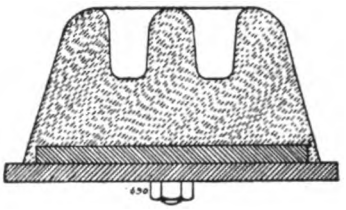
The Hopkinson tire before being fitted has a curved base, and is wider than the wheel to which it is to be attached. The wheel is provided with a recessed steel band around its entire circumference, and the rubber tire, when compressed by side flanges, sinks into this recessed band and grips the channel rim (formed by the removable flanges) in such a manner as to make removal impossible until the side plates are again released. Retaining bolts at equal distances round the felloe hold the side flanges in position. As an additional safeguard against the tire creeping the side plates or flanges are serrated on the side that comes in contact with the rubber, so that at the time the rubber is displaced from the sides to the center grooves or recess, it also forms into these serrations, making creeping practically an impossibility. It is altogether a very effective and simple job. Each tire has a twin tread, which tends to reduce road shocks and side-slip.

The Polack tire is also vulcanized to a steel band, which is provided with slots which engage corresponding projections on the wheel rim. The tire is forced over the rim by hammering on the steel band where it is unprotected by rubber until it meets a flange or raised portion of the rim on the other side. It is then made thoroughly secure by a slot ring which fastens on to projecting portions of the steel rim. To secure a tighter fitting tire it can, if necessary, be made a trifle smaller than the steel rim and forced over the wheel hydraulically; as, however, the steel band cannot be expanded, a layer of soft rubber 1-8 inch thick is inserted underneath, which, owing to its elasticity, balances the difference required in the expansion. In either case the whole operation is very simple, and tires can be replaced in a very little while.

The Sirdar tire, the manufacturers of which were the first to introduce twin tires, is sprung over a channel rim of peculiar construction, and by special machines which give equal compression throughout the circumference of the tire. These tires do not overhang the edges of the rim, and when, therefore, the weight of the vehicle presses the rubber between the rim and the road it cannot cut the edges. The deep cushion of rubber is also uninterrupted by the edges of the rim, so that all the rubber below and above the rim supports the wearing surface, and the whole of the rubber is utilized in absorbing the shocks. The downward pressure forces the rubber into the mouth of the rim, which prevents any possibility of creeping, and the sides of the rim are so arranged that the lines of force from a direct or side pressure enter the mouth of the rim and meet the flat side at such an angle that the force rebounds to the opposite side of the rim, thus tending to cause the tire to wedge more securely in the mouth in proportion to any strain put upon it. The Sirdar tires have no wires through the rubber.



Twin Tread Tire for Motor Bus Rear Wheels.



The Pioneer Tire.

The Peter Union tire is prevented from stretching or creeping by vulcanizing an endless steel band in the rubber. In fitting this tire an iron rim, with a flange on the inside only, is first attached to the wooden felloe, and after the tire has been pressed on to this rim a detachable side flange, or tension ring, is fitted to the outside of the wheel and is drawn together by means of a screw with right and left-handed thread. The iron rim is provided with a groove at its outer edge, and the tension ring with a projection, or shoulder, which fits exactly into this groove, and when drawn together by means of the screw, forms, with inside flange, a channel rim in which the tire is embedded.

PARCELS MOTOR DELIVERY

A parcel motor delivery company has been organized in Fort Wayne, Ind., by a number of merchants who have absorbed the horse wagon business of the Merchants' Parcel Delivery Company. The new concern will be known as the Merchants' Motor Delivery Company. It will be managed by Eugene Perry.

A motor ambulance will likely be employed to convey people suffering from contagious diseases to the isolation hospital in Chicago. Four horse-drawn ambulances are now used for this purpose, and very often they are driven from 15 to 36 miles before patients are disposed of.

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Interchangeable Bodies

Spare Bodies Avoid Loss of Time in Loading and Unloading in Transfer Work

OFTEN as much time is consumed in loading and unloading wagons as is required for the performance of journeys. This is partly the result of having no spare bodies for the vehicles. In a non-stop service where activity and regularity of loads and trips are the principal factors the use of interchangeable bodies becomes necessary if the maximum usefulness of the power plant and running gear of the machines is to be developed.

In transfer work calling for continuous duty with full loads a single vehicle with two or more interchangeable bodies located at the terminals might easily perform the service of two vehicles which did not possess this advantageous feature of equipment. Having capacity for work limited only by the skill exercised in its administration, the power plant and running gear should be employed in as nearly continuous service as possible in order to obtain the best results.

There is nothing novel in the suggestion that interchangeable vehicle bodies be used. The practice is as old as teaming by horses. At this moment we can only recall a few instances in which it has been applied to motor road transport. Some foreign municipalities, whose street cleaning and refuse hauling is performed by motor vehicles, haul their building supplies in power wagons which are provided with spare bodies which can be readily slid into place on rollers sunk in the frame and clamped in position by a simple fastening. Some building contractors in France, who also make use of motor wagons, find great advantage in the possession of spare bodies.

Short hauls in any form of transportation are generally regarded as uneconomical. When the work consists of transferring merchandise from one terminal of a route to another, such service usually calls for large loads and low speeds. These are conditions which favor the use of interchangeable bodies, as the time wasted in loading and unloading, where the volume of merchandise to be moved is considerable, represents a loss which is very impressive in the aggregate. If freight is ready to be moved, and machinery is available to transport it, the daily tonnage hauled must depend upon the body capacity, and if it is inadequate there must be a further loss.

Owners whose wagons are employed in transfer service might well study the freight service of a railroad, which is conducted with the fewest possible number of locomotive units and the largest number of freight cars. In reality freight cars are comparable to so many spare vehicle bodies. They are loaded during the time that the engine is employed in hauling another train of cars to destination and returning with a third train to the original point of departure.

Theoretically there should be no time wasted in motor road transfer work. A good system of administration would keep the loss arising from such a source down to a minimum. Employing interchangeable bodies, their removal and replacement could be accomplished by means of the vehicle's power plant and a winch. In the majority of horse services of this character no special provision is made at terminals for the economic employment of the labor used in loading and discharging. The teams are often spent with work and require a brief season for recuperation of their powers. The freight handlers do not work with precision. They reflect in the irregularity of their labor the inferior and irregular method of transport. Using motor wagons, however, the offices of all labor employed at terminals becomes precise and constant, especially if interchangeable bodies are there to be filled and emptied.

Another advantage of having interchangeable bodies in motor transfer service is that the vehicle speed can be kept constant. The importance of constant speed is very great, as it enables maintenance and operating expenses to be closely calculated. It is irregularity of service conditions which makes it so difficult to know what operating expenses will be. Tire wear can be definitely ascertained if the factors of speed and load are known, and drivers can be held to strict account for expense which is unwarranted. Regularity of speed is also advantageous for the power plant, whether its source of energy be gasoline, steam or electricity.

HEAVY PURCHASE OF MOTOR POSTAL WAGONS

FOR some years past the Hungarian postal department has employed motor tricycles in the collection and delivery of its mails. Satisfied with the economy of these little machines the department has now decided to make more extensive use of motor vehicles, and has placed an order for 110 light wagons and 16 heavier machines to be used in parcel post service. It is the intention to reorganize the Hungarian postal service, and to accomplish this the sum of $1,250,000 has been appropriated, a large share of which will be expended in the purchase of motor cars for actual operation by the government and in assisting state-aided road transportation enterprises which are under contract to carry government mails.

It is said that the Curtiss Manufacturing Company, of Hammondsport, N. Y., is at work on a large order for its two-cylinder motor-cycles received from the War Department. These are for use by the Signal Service Corps.

Authority has been granted the postmaster of Pittsburg to procure the service of automobiles for mail collection and delivery.

Cleveland's postmaster has asked the authorities at Washington to investigate the condition of the local mail service and decide if motor wagons and trucks can be used to advantage.

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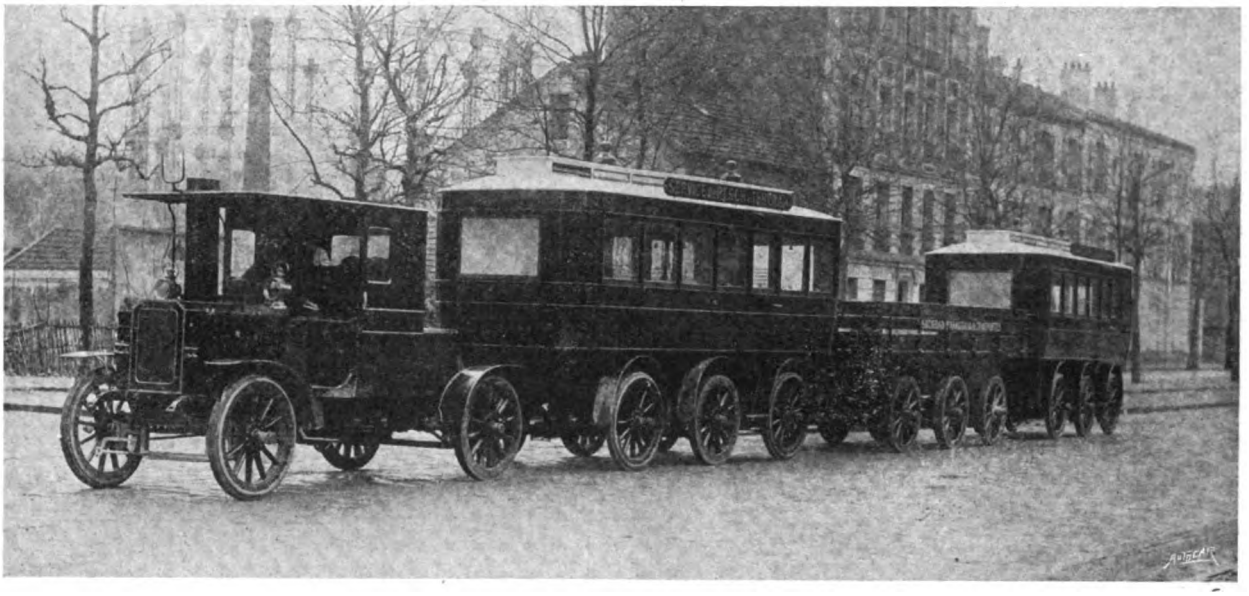


Renard Mixed Train to Carry Forty-Four Passengers and Sixteen Tons of Merchandise at Maximum Speed of 10¾ Miles Per Hour.

Road Train Transport

Many Companies Being Organized to Develop This Interesting Form of Freighting

THE transportation of merchandise and passengers by self-propelled road trains assumes more than ordinary importance in view of the fact that a company with $1,250,000 capital is being formed in England to perform such service. The organization of this company is John Bull's answer to questions concerning the practicability and availability of road trains.

The Renard train which is the type to be exploited by this company, was described at considerable length in the October issue of this paper. Each trailing unit of the train has six wheels, each vehicle following accurately in the track of the locomotor without tendency to side slip or cut corners. The train can be backed with like accuracy. The brakes of the whole train are under control of the driver. The adhesion of the driving wheels depends upon the weight of the whole train, and not upon the weight of the locomotor. The train can go wherever single vehicles can go. If a wheel or axle should break there is no interruption to the train service, the remaining wheels and axles sufficing to afford traction. The flexible transmission insures continuous motion if a coupling should break. As many trailing units as the locomotor can haul may be used in making up the train.

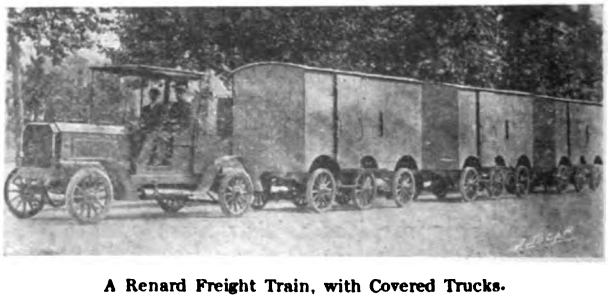
* * *

It is significant that one of the directors of the company referred to in the opening paragraph is a retired military man of much distinction. Evidently his connection with the organization is the result of settled convictions concerning the usefulness of motor road trains in army transport, a form of service in which the Renard train has distinguished itself. Other members of the directorate, however, are not so sanguine of success in this direction, preferring to rely upon the patronage which might be expected to come from individuals, communities or concerns having large volumes of freight to transport long distances with considerable regularity. For military purposes it is unlikely that the train would be as advantageously employed in England as in Europe. The characteristic of European roads is that they are straight and wide, while the characteristic of British thoroughfares is that they are narrow and tortuous.

* * *

There is no doubt that in regions where distances are great and population is not dense the motor road train could be successfully and profitably employed. In the western part of our own country, for example, where railway transportation facilities are poor, and considerable flow of traffic is arduously supported by horses and mules, there would be decided advantage in resorting to the use of this form of train haulage. Even in localities where the distances separating communities are not very great there would be opportunity for its use, particularly among agriculturalists who now find it necessary to move large supplies of produce to market each day and in doing so are compelled to employ the road and slow moving horses for lack of better accommodations.

The single motor vehicle, carrying its own power and all of the load, has no monopoly except in city service and the time must eventually come when road trains,



A Renard Freight Train, with Covered Trucks.

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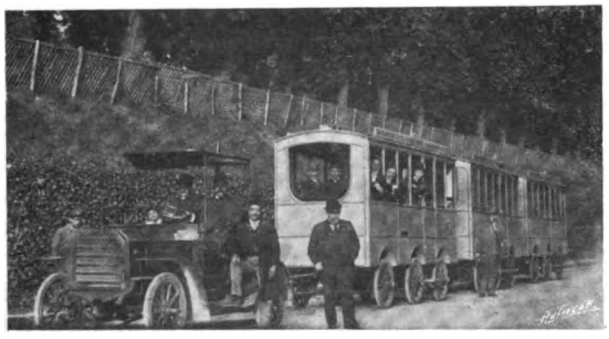
motor wagons with trailers and other devices of similar character will be largely employed. It was Henry Ford, the well known automobile engineer and manufacturer, who predicted that the bulk of rural haulage would one day be accomplished by road trains, whether long or short, but not by single motor units.

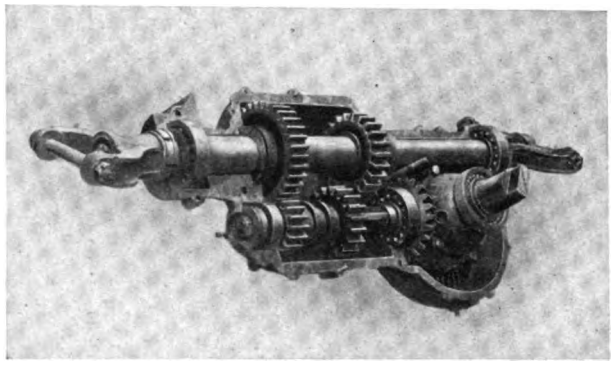
As a basis for speculation concerning the employment of road trains in thinly populated districts, it is only necessary to reflect upon the difficulties which now attend merchandise transportation in the far west, and in such countries as New Zealand where like physical and sociological conditions prevail. It is common in these districts to find draft animals covering distances not greater than 100 miles at an expenditure of time seldom reckoned at less than 10 or 11 days, and at that pulling very small loads. In New Zealand, and other British colonies, it is just as common to see five and ten trailing vehicles loaded with wool, or other produce, being drawn by a traction engine, the trailing vehicles having floors which are from four to five feet from the ground and in consequence of which the height of the loaded wagons is such that occasionally they capsize from topheaviness.

* * *

One of the marked advantages of the road train is its ability to operate on open ground as well as on smooth highways. This quality makes it peculiarly desirable in regions which do not yet possess any highly developed commercial life, but which nevertheless have need for the most modern forms of road transportation. The Renard road train locomotor, which is really a motor wagon minus its carrying capacity, weighs a little more than two tons. During the course of a recent test with three trailing vans the first carried 3 tons, the second 2¾ tons and the third 2½ tons, with passengers whose total weight aggregated half a ton. The total weight of the train during this test was 17 tons, which shows a very high percentage for useful load; in fact the efficiency of the train is considerably greater than that of individual motor wagons. The consumption of gasoline by the locomotor is about three and one-half gallons per hour when the speed averages about 7½ miles an hour. The maximum speed of the train is 10 miles per hour. It will make 6 miles per hour over ordinary roads with occasional gradients of 1 in 12. When used in military service it occupies much less road space and requires a smaller guard than if the materials were transported by horses.



A Renard Passenger Train with 50 H. P. Locomotor in Service in France.



Differential and Transmission Gear of Renard Vehicle.

It must not be supposed, however, that the Renard road train is the only development of its kind. It is the type best known, and on that account is most frequently in mind when long distance haulage of great quantities of merchandise or materials is being considered. In Italy the gasoline-electric road train devised by Cantono has been demonstrated with much success. In this train the tractor is fitted with a gasoline motor which is connected directly to a current generator with a 75 hp. motor. Insulated cables lead the current from the generator to two motors on the rear wheels of the tractor, and also to each of the trailers, which latter are supplied with electric motors on their rear wheels. Each of the trailers is mounted on six wheels, the first pair of axles forming a bogie. Each unit of the train starts simultaneously. The tiller method of steering used in the Renard train is also used in the Cantono train, all vehicles following accurately in the path taken by the leader. The Italian military authorities have ordered a number of Cantono road trains for use in transporting military stores.

* * *

The German conception of what a road train should be is entirely different from that which prevails in France or Italy. It is composed of six wagons, each of which is fitted with but one axle. The trailers are coupled in pairs. The hauling machine and its tender are also fitted with but one axle apiece. Each of the coupled trucks is so connected that the axle of the second is led into the path previously followed by its leader. The steering control is such as to permit the train to be driven backwards without uncoupling the motor or turning the train around. The power of the tractor is steam, tar oil and crude petroleum products being successfully used as fuel. The V shaped tubes of the boiler are in direct contact with the fire. The heating surface of the boiler is about 110 square feet for small boilers, and 130 square feet for large machines. All wheels are supplied with ball bearings. The wheel diameter of the trailer is 6 feet wide. The tractor wheels are 6 feet in diameter, with 10 inch tread. Such a train, which hauls from 16 to 18 tons, is 66 feet long. The tractor weighs about 5 tons, the tender 5 tons more, and each of the single-axle wagons about 3,000 pounds. The average speed with a load of 16 tons is 3 miles an hour; empty the train travels 6 miles an hour. Grades of 1 in 18 are easily negotiated; on stiff grades the train is divided. When it becomes necessary for the

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tractor to haul all of the wagons up an exceedingly heavy grade, a drum winding machine, with which the front of the tractor is fitted, is employed. Two trains of this sort are used in the German army.

The system of continuous propulsion renders the employment of Renard road trains very advantageous in hilly countries. The hill climbing powers of the train have naturally received unusual attention. The following table shows the total tonnage which can be propelled by a 50 hp. motor at 5, 7½ and 10 miles an hour over gradients of from 1 to 10 per cent; it being asserted that the results given in the table slightly understate the results obtained by actual experiment:

Miles per hour	Level road	1% gradient	2% gradient	3% gradient	4% gradient	5% gradient	6% gradient	7% gradient	8% gradient	9% gradient	10% gradient
	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons	tons
5	33.7	24.2	18.8	15.4	13.0	11.3	9.9	8.8	8.1	7.3	6.8
7½	22.5	16.2	12.5	10.2	8.7	7.6	8.0	5.6	5.4	4.9	4 5
10	16.9	12.1	9 8	7.7	6.5	5.6	5.0	4.5	4.1	3 6	3.4

* * *

The economy of the Renard train is well established in many of the services in which it is employed. A few instances will suffice to show the profitable nature of its work. A company with a capital of $100,000 is operating these trains from the gates of Paris to Ormesson, 20 miles distant. All expenses are calculated at $30 per day per train. Each train makes twenty journeys per day. Its daily earnings are estimated at $50 per day, leaving a profit of $17.50 per day per train. Operating four trains the service would yield $70 per day profit, or sufficient to pay an annual dividend of 26 per cent upon the capital stock of the company.

In Holland two Renard road train companies are being operated. Services are also being operated in Austria-Hungary, Russia, Servia, Roumania, Turkey, Portugal and Paraguay. The Renard train operating at Teheran, Persia, carries passengers to Resht at a charge of $4.32 as against the former charge of $20 in a most uncomfortable conveyance. Merchandise is transported over the same route at $12 per ton as against $24 per ton, the price charged by the railroad. India, Burmah, Ceylon, Central Africa, and other remote parts of the world will in all probability soon solve their most difficult transport problem by means of road trains.

The Auto Transportation Company of Buffalo has been incorporated with a capital stock of $100,000 to operate motor buses between the city line and Shelton Square along Delaware avenue and between the chief places in Erie, Niagara and Genesee counties. The directors are Fred B. Eberhardt, Blinn Yates and Robert W. Day of Buffalo, Uriah L. Upson of Orchard Park and George J. Kopp of Hamburg.

A motor patrol wagon is being constructed for the police department of Richmond, Va.

GASOLINE WAGONS STILL BARRED FROM DOCKS

GASOLINE wagons are still prohibited from certain steamship and railroad docks in New York and vicinity, being denied equal privileges with electric and horse-drawn wagons upon the plea that their fuel is a menace to the safety of stored merchandise.

At a meeting of the New York freight agents' association Manager Reeves of the American Motor Car Manufacturers Association and a representative of Fiss, Doerr & Carroll, the large horse dealing concern which has recently been recruited to the ranks of motor wagon users, were present to ask the cooperation of the agents in securing justice for the gasoline wagons. When the situation was thoroughly canvassed, the freight agents very readily agreed to use their influence to have the prohibiting restriction removed, and pointed out that recently they had passed a resolution favoring the admission of gasoline machines to wharves and depots upon the same terms as other vehicles. It now only remains to convince the Trunk Line Freight Association that the gasoline vehicle is not a menace to shipping and railroad property.

Speaking of the right of gasoline truck owners to equal privileges on docks and piers with owners of other vehicles, Harry A Knox, president of the Knox Motor Truck Company, says:

"They occupy only half the room of horse trucks, carry twice the load and make double the speed, which is equivalent to a dock three or four times as large as those built now. Unfortunately, there has been a law in effect for some time which requires gasoline to be emptied from the tanks of all automobiles before they are brought on the docks. This was intended for cars to be shipped, yet the companies have insisted that it be applied as well to freight carriers. There are hundreds of prominent concerns in New York shipping goods over railroads and steamship lines that are prepared to indorse any move that will enable them to get the use of the docks for their commercial vehicles, and those railroad and steamship lines which grant the privilege are certain to receive the greatest proportion of the trade.

"About a year ago the local Freight Agents' Association passed a resolution, which was forwarded to the Board of Fire Underwriters, asking that dock privileges be granted to all commercial vehicles. The underwriters evidently class the present gasoline vehicle of the commercial type with those of three or four years ago, and insist that there is an added fire risk. This is far from true, for the motor trucks of today are absolutely safe from fire, the gasoline being confined in a sealed tank, so that the possibility of fire is extremely slight.

"There is far less danger in a motor truck using a pier than there is in the handling of vitriol and gunpowder, which must be shipped just the same as any other manufactured article. I believe that when the many advantages of motor trucks are clearly understood by the shippers, by the transportation agents and by the Board of Underwriters, every possible privilege will be granted, and, in fact, their use will be encouraged."

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Motor Wagon Operation

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

IT is not easy to stop a small leak in a radiator. If convenient the best plan is to send it to the maker for repair. Not one tinsmith in a thousand is equipped, let alone qualified, to correct the fault where the radiator is of the cellular type. As a rule, the leak is very minute and the water works its way along the many small ridges until its source is lost. If the leak is of pin point size it can be fixed by inserting a handful or two of bran. An immediate closure must not be expected, as it will take some time for the bran to float to the proper point. Sawdust has been known to cure leaks, but it has the fault of sometimes packing in the pump—to the detriment of the latter. Even when bran is used, if there is a pump in the water circulating system, it will be well to look at the pump after the leakage has stopped, to clean out any deposit that may clog at any point in its working.

Changing Sliding Gears

Many drivers are too impatient when changing from high to lower speeds, and do not allow the fixed gears to slow down sufficiently before moving the change speed lever from one notch to another. The correct practice is to declutch and wait for a few seconds before putting the gears in mesh. This allows the stationary gears to slide in without clatter and without chipping the teeth. In changing from a low gear to a higher one it is not necessary to wait; rather it is better to make the change quickly, as both trains are moving. In some cars it facilitates changing to a lower gear to let in the clutch gently at the same moment the change speed lever is manipulated.

Results of Misaligned Front Wheels

Often the front wheels get out of line owing either to the bending of the coupling rod between the steering knuckles or the springing of one of the knuckle arms. More rarely a bent axle may bring about the same result. Whatever the cause, the effect must invariably be to produce undue wear in the tires and bring a tremendous strain on the steering connections. Often, when the wheels are out of line, the misalignment is so slight as to be hardly perceptible to the eye, while the effect on the guidance of the car is yet sufficiently great to be readily appreciable to the sensitive hand. At all events, whenever it is suspected that the alignment is not perfectly correct, it is well to test the wheels and if an error is found, no matter how slight, to correct it at once, as it may be an indication of some latent difficulty which is really serious in its nature.

To Test the Alignment of Wheels

The simplest way to test the alignment of wagon wheels is to stretch a cord along the outside of the front and back wheels from end to end of the machine, taking care that the steering wheels are as nearly in line as possible. If the string just touches the front and back rims or tires in four points, and without bearing heavily or being bent outward, the same test applying equally well on both sides, it may be taken for granted that the mechanism is true as far as the fore and aft relation is concerned. On account of the inward pitch of the front wheels in most cars, the test should be applied close to the ground. Otherwise considerable apparent distortion may be discerned. Another method of test, which is applicable when a straight edge is used for the purpose, consists in laying the test-piece along the outside of each of the front wheels in turn, allowing it to project in front for some little distance and dropping a plumb line from its inside edge at three different points, marking the points of contact with the floor. Repeating the process on the other side, yields another set of three points, through each set of which straight lines may be drawn. The distance between these lines is then measured carefully at two points, one close to car and the other some little distance away. If the two measurements thus obtained are not equal within the practical limits of accuracy of the test, it may be taken to indicate that the wheels converge or diverge by the amount the two lines are out of parallel. The test is entirely independent of the relative position of the front and back wheels, and applies irrespective of the amount of camber or pitch of the axle. In any case where the steering gear has been thrown out of condition for any reason, or when it has been dismounted for the sake of replacements or repairs, it is essential that the alignment be tested in some such way, even though it is not known that anything is wrong.

Flooding Out the Cylinders

Usually when the advice is given to flood out the cylinders of a motor at frequent intervals with kerosene, the reason assigned is that is dissolves the lubricant which is apt to be hardened on the walls, and thus gives the piston a chance to do its work without undue frictional resistance. As a matter of fact, however, its effect upon the piston rings is of far greater importance. The rings, it is to be remembered, are fitted into slots in the piston, a clearance of only two or three hundredths of an inch being left for the working which is bound to take place. If the slightest particle of oil is allowed to harden in this delicate bearing, the efficiency of which is indispensable to the retention of compression in the cylinder, the immediate result will be a clogging which in a cylinder that is out of true will cause a break. Otherwise the only result will be a loss of compression due to the unyielding of the rings. A little thin oil or kerosene filtering over the sides of the piston soon finds its way into the seatings of the rings and clears them of all foul deposits.

To Remedy Fan Belt Slippage

If the belt which drives the fan, placed behind the radiator for cooling purposes, slips, a good remedy is to burn some ordinary black rubber with a match, applying the burnt part to the leather. While good in this case, it must never be used on the leather of a cone clutch.

Motor buses are serving the railroad stations and some of the hotels in Omaha.

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ABUSE OF STORAGE BATTERIES

SOME establishments using electric vehicles evidently imagine that it is necessary to charge at the end of every short trip in order to insure efficiency of service. They are loth to believe that the machines can be relied upon to perform their work without fully charged batteries, even when assured by experts that the daily mileage is well within the capacity of the battery. The inevitable result is rapid deterioration of plates.

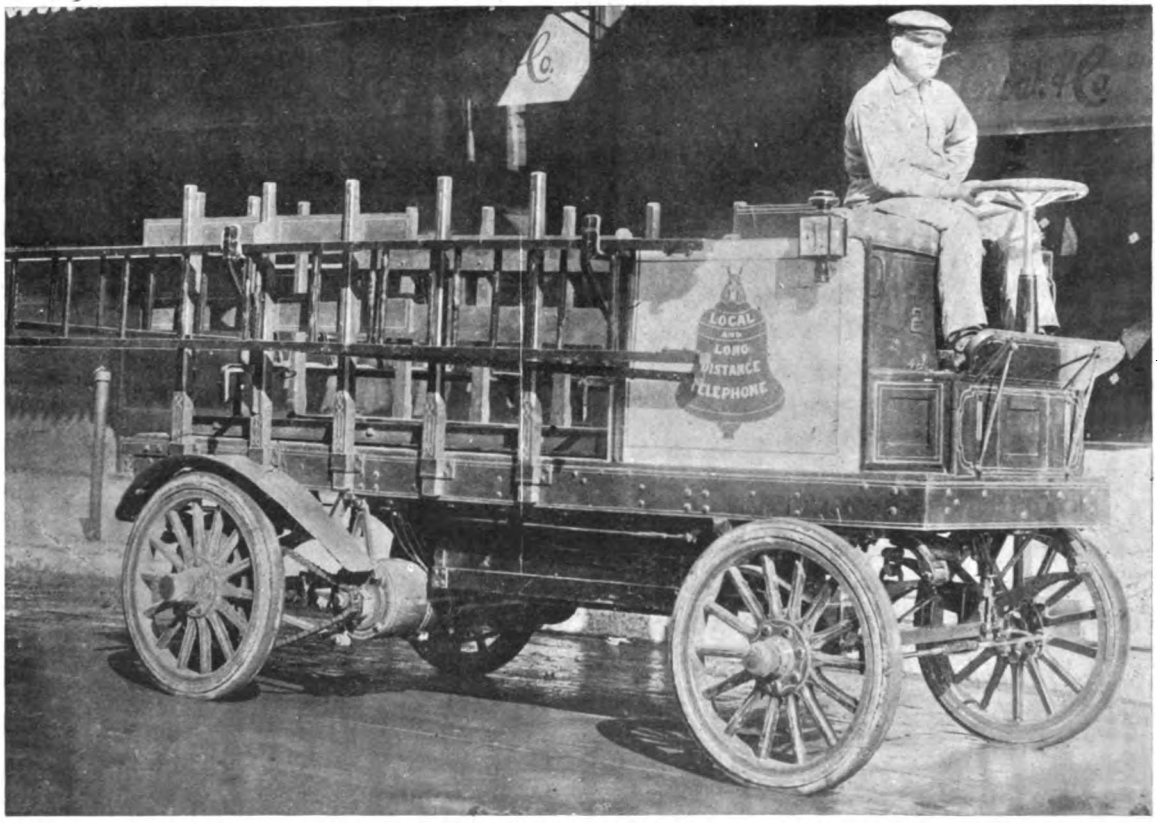
As an accommodation to guests one of the eastern hotels operates an electric bus. About twenty-five trips are made daily to the railway depot, which is distant half a mile. Counting the return trips, this gives a daily average of 25 miles. As the vehicle is adequately powered for such service, one would think it would be left alone upon return to the hotel after each journey to the depot. But so apprehensive is its owner of wha may befall in the course of this one mile run that he insists on keeping the battery on charge all the time the machine is standing at the hotel entrance. This absurd practice has been going on for years, the owner evidently being unaware that the battery, having no more than so many charges and discharges in it, is undergoing deterioration much more rapidly than would be the case if it were regularly exhausted in service.

There are two ways of overcharging a battery. First, by charging too long at a high rate, and, second, by charging too frequently. If a battery that will run a vehicle forty miles is charged after every short trip of five or ten miles, it is charged four or five times as often as it should be. A battery should not be charged until over 50 per cent of its capacity has been exhausted, unless in so doing it would necessitate leaving the battery partly discharged for several days. If excessively overcharged, a rapid deterioration of the plates will result. However, keep in mind the fact that a legitimate "overcharge," so-called, may be given from one to three hours at a low rate about once a month and will prove beneficial to the battery.

COMBINATION FUEL FOR ENGINES

ALCOHOL vapor and acetylene gas have recently been combined to produce a fuel suitable for use in engines of the type ordinarily used in automobiles. The alcohol was 83 per cent pure, the remaining 17 per cent being water which acted on the calcium carbide to liberate gas. The carburetter was ordinary construction. The fuel mixture in being conducted to the engine was intercepted by a screen containing a layer of calcium carbide, and the water freeing the acetylene gas the latter was combined with the alcohol vapor. Engines using alcohol as fuel can be started cold by this process, without resorting to the aid of gasoline.

The purchase of a motor hose wagon has been authorized for Winchester, Vt.



Another Telephone Company's Truck

TWO two ton electric trucks like that shown above are being operated in St. Louis by the Bell Telephone Company of Missouri. They have been in service for the past year and a half. Originally these machines were used in transporting passengers through the World's Fair grounds at St Louis. They were rebuilt in order to make them suitable for the telephone company's work. Each is fitted with a winch and motor for hoisting. These 2-ton trucks are used in the installation of aerial cables, although they are occasionly employed for underground cable work.

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ELECTRIC BAGGAGE TRUCKS

MONTHLY reports of operation are compiled by the Pennsylvania railway in order to determine which of the three electric baggage trucks with which it is experimenting at the Broad street station in Philadelphia and Altoona are most suitable for service. The following description applies to the truck which has so far been found most serviceable, the method of control, functions, appearance and other features of general interest having been described and illustrated in the April number of this paper:

Power is taken from a storage battery contained in a box secured to the under side of the platform near the middle. It consists of 14 Willard cells and has a capacity of 136 ampere hours. The batteries are charged about eight hours daily at the rate of 17 amperes. Each of the rear wheels is driven by a Westinghouse type AA, 4 pole series wound, 20 volt motor. Double reduction gearing is used between the motor and the rear wheel, and each motor is provided with a solenoid brake of the multiple disc type on the end of its shaft. These brakes are essential in securing safe operation. If the truck is in motion it stops promptly and automatically as soon as the power is shut off. Control of the motor is made as simple as possible. Only two speeds forward and two backward are provided. These are approximately 4 and 6 miles per hour for the loaded truck, and on crowded platforms they have been found fast enough.

The two motors are operated in series and on the low speed a wire resistance is inserted. The motor current is controlled by the two single pole solenoid switches, one for the low and the other for the high speed. The solenoid switches are enclosed in a box directly in front of the storage batteries, and current for operating them is controlled by contacts in a small box on the outer end of the tongue or handle.

The contact box is of metal, cylindrical in form, and operated by a rod which slides axially through it. The rod is provided at one end with a ring, which is readily grasped by the operator. A slight movement of the rod starts the truck forward at low speed; further movement of the rod gives the high speed. The rod is returned to the off position by a spring, so that the instant the ring is released the truck stops. It cannot be started by any accidental knock, but only by an intentional pull on the ring. The pole changing switch for running the truck backward or forward is located in the box with the solenoid switches, and operated by a small lever under the front of the platform. The tongue, or handle is connected by reach rods to pivoted bell cranks carrying the two front wheels in a way similar to that generally used upon automobiles.

This truck has been in operation about six months and has won the confidence and approval of the men who use it. One man is enabled to handle immense loads of baggage and mail quickly and without the usual tugging and pulling by several men.

Baltimore's police commissioners have purchased an electric patrol wagon.

COST OF OPERATING MOTOR OMNIBUSES

THE cost of operating motor buses is a matter which, like the cost of operating motor wagons, varies as the skill of the drivers is great or small and as the executive control is lax or firm. The magnitude of the installation also affects the cost of operation. Nineteen cents a car mile is considered a fair average for operating cost in the city of London, while 20 cents per car mile is representative of the cost of operation in the country. The distribution of costs for the latter service is by experts calculated as follows:

Fuel	3.10	cents
Grease, carbide and oil	.52	"
Tires (by contract)	4.00	"
Drivers and conductors	3.54	"
Tickets	.14	"
Attendance on vehicles	.94	"
Attendance at garage	.36	"
Engine and chassis repairs	2.42	"
Body repairs	.12	"
Buildings	.12	"
Sundries	.34	"
Rent, taxes and insurance	1.34	"
Salaries	.14	"
Total	17.08	cents

It will be observed that the items of general administration and depreciation are not included in the foregoing table. For the former .76 cents should be allowed and for the latter 2.60 cents, which would bring the total of operating costs for rural bus service to 20.44 cents a car mile.

It is compulsory in Paris to fit the rear wheels of motor buses with solid tires having diagonally placed sections. This is done to reduce vibration. Front tires may be smooth. Further than this, the chassis has to be mounted on the axles by steel springs which must not be stiffer than stability demands, and flexible enough to permit the body to ride easily whether empty or partly or fully loaded.

A motor stage line is operating between Picture Rocks and Montgomery, Pa., with Muncy as an intermediate point. The length of the journey is 20 miles.

The postmaster of Detroit has been authorized to make contracts for motor delivery from the main post office to all of the outlying post offices of Detroit, with the exception of the Delray and Grand River offices, beginning July 1.

A motor hose cart and chemical wagon to cost $4,200 has been bought for use by the Ringgold hose company of Newburgh, N. Y.

Nathaniel Church, owner of a stage line between Tiverton and Seaconnet Point, Mass., intends to replace his horse-drawn vehicles with motor buses.

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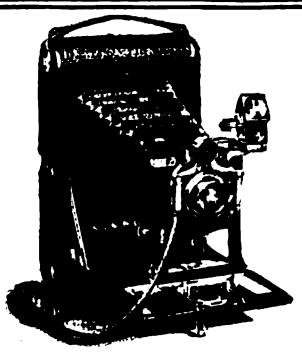

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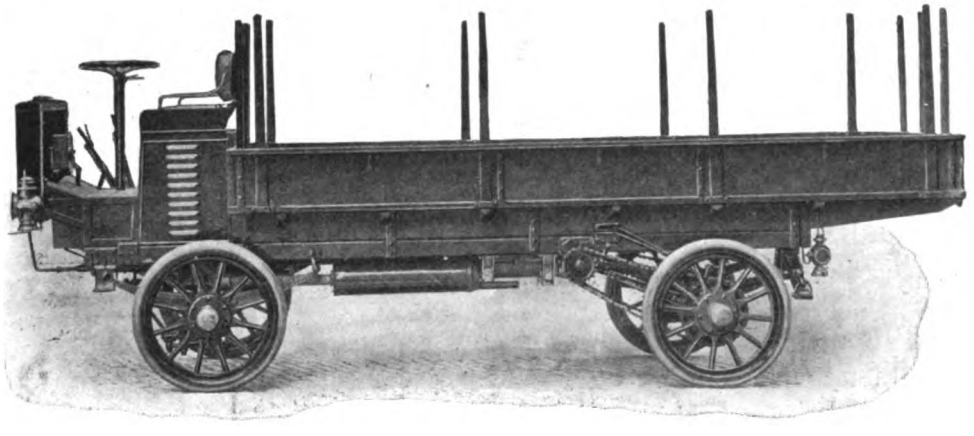

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

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WALTER WARDROP, EDITOR

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Big Orders Are Common

Many Evidences of a General Desire to Employ Power Wagons on a Large Scale

SCARCELY a month passes without the record of some notable transaction which signifies that the commercial world at large is ready to accept the motor wagon for city merchandise transportation. A few years ago it was with extreme difficulty that establishments having a large volume of merchandise to move could be persuaded to look upon the service of the machine as anything but an experiment, notwithstanding thousands of similar vehicles had long before been put to work and progressed to the point where they were definitely adjudged successful. The situation is different today. Orders are now being placed with manufacturers in full assurance that if the vehicles are treated with the consideration they deserve, and no error of judgment is made in their application, they will earn handsome dividends upon the cost of investment.

* * *

It is more gratifying to observe, however, that many of these orders are not for a few machines, which must establish their economy before more are purchased, but from their magnitude are obviously intended to be taken as evidence of a sharp desire to replace an entire draft animal transportation equipment by a system vastly more economical and convenient.

It was inevitable from the beginning that the horse drawn wagon should make way for the motor wagon. But what was not so evident was the policy to be pursued in accomplishing the substitution. The eagerness of manufacturers, secure in knowledge of the economic superiority of the machine, was, at the outset, coldly received by a world unprepared for a revolution in minor transportation. It took some time to break down the reserve with which the power wagon was at first confronted. Gradually this was done, and of late years the consideration uppermost in the mind of those contemplating the employment of industrial motor vehicles has been, not utility or economy, which are universally conceded, but wholesale employment, it being realized that experiments with single machines only very mildly denote the great gain to be derived from making use of large numbers of them.

The evidence of the motor wagon's economy, so apparent from the outset, has during the past few years been wonderfully augmented by the activity of gasoline vehicle manufacturers.

It may truthfully be said that the labors of the latter have crowned the work begun six or seven years ago by the electric vehicle manufacturers. They have broadened the field and given a more catholic aspect to the industry. Their products have made such an astonishing impression upon the public that it has suddenly come to realize there is scarcely any commercial service in which horses are employed that may not be more advantageously accomplished by machines.

* * *

Another and not unimportant reason for the high esteem in which the motor wagon is held, has its origin in quite a different quarter. In the beginning, when nothing but electric vehicles were offered for sale, Thomas A. Edison cast a spell over those who were strongly inclined to purchase by letting it be known that he was experimenting with a battery possessed of miraculous life. As time passed, however, and his promise was not redeemed, the power of the enchantment was lost, purchasing capacity was released, and the power wagon was accepted at its current worth. It is now asserted by men who are habitually accurate in their judgment that Mr. Edison has abandoned hope of bringing his invention to the

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point of usefulness originally claimed for it, and has in effect told his business associates that hereafter they must depend upon their own efforts for whatever success may attend the battery, he having exhausted his powers of invention. No longer has Edison's wizardry power to menace an industry or retard its progress. His reign of terror is ended. As evidence of the truth of this we point to the freedom with which large establishments everywhere throughout the country are purchasing electric vehicles equipped with other types of battery.

* * *

To fortify the statement in the opening of this article, that the purchase of motor wagons is taking place with unrestrained freedom, we shall record a few of the more important transactions which have come to light of late.

A large drygoods concern in Brooklyn has bought fifty one-ton electric wagons, five two-ton trucks and five machines with high speed and low load capacity for special delivery work. This is undoubtedly the largest single order which has ever been placed for vehicles of this type in this or in any other country by a concern whose business did not exclusively consist in the transportation of merchandise, and is only exceeded in commercial importance by the order for 150 machines placed two years ago by the Adams Express Company.

Another dry goods company in St. Louis, Scruggs, Vandervoort & Barney, recently purchased five machines as a first installment of twenty-five which are needed.

An express company on the Pacific coast, having bought twenty-five two ton wagons at the beginning of the year, last month, found its business prospering at such an amazing rate that its manager was hurried east for the purpose of picking up machines of any kind wherever they could be found. To his surprise he discovered that every factory he visited was exceedingly busy with orders in hand, and that delivery could not be promised sooner than six months. At one establishment he learned that it has sufficient business to keep the plant busy making one machine a day for a year to come.

These transactions, which might be mutiplied until weariness overtook the narrator, represent but one side of the medal; the other side shows that in nearly every important city throughout the country there are concerns which have avowed their intention to operate motor wagons on a large scale just as soon as they can find manufacturers whose plants and facilities for production are not already engaged.

* * *

It is common nowadays to hear of firms placing orders for ten, fifteen and twenty thousand dollars worth of motor wagon equipment. The Brooklyn department store's order represents an expenditure of $125,000. Truly the virus of the power wagon has taken.

MILITARY MOTOR VEHICLES

STATISTICS have been prepared by experts in the Hungarian army which show that a great economy can be effected by the substitution of motor vehicles for horses in artillery, sanitary, engineering and other branches of military service. The figures submitted graphically indicate how great would be the reduction in non-combative units if horses were not employed. It will be observed that the number of horses is three times greater than the number of horse-drawn vehicles. Spare horses require attendance, and thus a large staff of supernumeraries is made necessary. The administration of any service which relies in large degree upon the labor of horses is always as expensive and cumbersome as indicated in the following table:

	Horse Vehicles	Horses	Motor Cars	Trailers
Munition Parks	3,750	15,000	450	—
Sanitary work	3,900	9,600	220	—
Bridge equipments	570	2,700	120	240
Miscellaneous	744	2,100	90	—
Reserves for above	1,400	2,800	—	—
	10,364	32,200	870	240

Six motor cars are in passenger and freight service between Amarillo, Texas, and Tucumcari, New Mexico, separate 115 miles. This district is not traversed by any railroad. The automobiles cover the route each way every day in eight hours.

ELECTRIC TRANSMISSION

AT a meeting of the New York Railroad Club, where many electric experts came together to discuss railway topics, a representative of the General Electric Company told about an experiment his company had made with a steam railroad car equipped with a gas engine to generate electricity for driving it. The car weighed 60,000 pounds and was run regularly at speeds varying from thirty to sixty miles an hour, and no difficulty had been experienced in its operation. The same company is now putting the same kind of equipment into a new car half the weight of the other one, and all concerned in the experiment believe that it will introduce a new and important feature of electrical traction, especially for sparsely settled districts.

Inasmuch as the residence districts of London are far from the center of the city, a theatrical manager has inaugurated the experiment of running a motor bus between the suburbs and his playhouse for the accommodation of the holders of reserved seat tickets. Seats in the bus are free.

Another gasoline motor driven fire engine has been delivered to the fire department of Paris. The machine, which weighs five and a half tons, readily climbed a 13 per cent grade, the steepest in the city. The engine has a 40 hp. motor and is equipped with a pump that has a capacity of 400 gallons of water a minute.

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An Investment of Over $600,000

Rapid Conversion of the Adams Express Company's System of Transporting Merchandise

NOTHING better illustrates the firm position of the motor wagon in the commercial world than the intelligence and persistence with which such a thoroughly well organized institution as the Adams Express Company proceeds to make use of the machine's superior service in every important city in the country.

In rough terms this company has up to date invested upwards of $600,000 in the purchase of electric wagons. These vehicles, numbering about 300, are scattered in New York, Philadelphia, Washington, New Haven, Rochester and Buffalo, in all of which cities their behavior excites unqualified admiration. It will hardly escape attention that many important cities, in which the Adams company operates, are not included in this enumeration. The Chicago, Pittsburg, St. Louis, Cleveland, Detroit, Milwaukee, Denver and San Francisco services are being conducted with the aid of horses. In due course of time, however, horse service will be abandoned in these cities. The policy of the company is not to precipitately convert its transportation method, but to effect change intelligently, installing motor service first at such points as can profit most from its economy. Thus Chicago, although the second city in the country, does not present the same problem in transportation to an express company which exists in New York. Street traffic conditions in New York are such as might be expected to match with an industrial center which is densely crowded within a very limited area. In Chicago, on the other hand, distant journeys are common unless the territory is split up into zones of operation and stations located within them.

* * *

It is sufficient excuse for not at this moment supplying cities of the second rank with motor wagons that the express company is unable to procure all of the vehicles it requires for duty at the stations already equipped with machines. The Adams company naturally prefers to move along the lines of least resistance, installing power wagons wherever they can be most advantageously used at the moment. Horse stable leases are inconvenient things when a concern desires to effect a supersession of the method of transportation. The buildings themselves are too big for a comparatively small power wagon equipment which could haul the same number of packages as a more extensive horse wagon equipment. Often they are located in districts which command high rentals, but which must be endured owing to the necessity for having draft animals in close proximinity to the regions of operation. Obviously, therefore, some years must elapse before the company can equip all of its stations with motor wagons.

* * *

For some time past it has been apparent that express traffic conditions in Indianapolis invited the employment of motor wagons. After a careful study of the local conditions the Adams company concluded to erect a garage on South Meridian street for the housing of 21 electric machines. Wagons of one and two ton capacity are to be installed. The building will be one story in height, 50 feet wide and 117 feet long. It will have a cement floor and a tile roof, the exterior being of glazed brick with stone trimmings. A store room 25 by 18 feet, and a repair shop 25 by 32 feet, will be placed in the rear of the building. The main room, where the vehicles will be charged, will be 50 by 90 feet. The cost of the garage will be $20,000.

* * *

In three of the cities where the Adams Express company has motor wagons in commission horse service has been entirely discarded. These stations are located at Buffalo, New Haven and Rochester. There are 21 machines in service at Buffalo, 12 in Rochster, 15 in New Haven, 70 in New York, 25 in Philadelphia, and 35 in Washington. These figures yield a total of 193 vehicles, to which should be added, in order to realize how heavily the company has invested in motor wagon equipment, 100 more which are in process of construction and as yet unassigned to duty.

* * *

The Buffalo service is the model of the lot. The rating of the wagons there employed is one ton. This rating however, is not correct; it should be 3,000 pounds. The misapplication was caused by the company giving the manufacturers specifications for machines of higher rating than the service actually requires. It is probable that the vehicles could be replaced to advantage with others of half their rating, and in all likelihood the change will be effected just as soon as the company can spare the misapplied wagons for duty in other services, without interruption to the Buffalo service. The error of misapplication was perfectly natural in the period when the wagons were purchased, and originated with the the executives of the company in New York, whose experience with industrial motor vehicles was at that time not nearly so extensive as it is at this moment.

What makes the Buffalo service model is the fact that throughout the year all of its vehicles are active. Such a thing as an idle wagon is practically unknown. It is scarcely necessary to say that this is due to the splendid organization which the company has developed. In the severe months of last winter slight difficulty was encountered in the Buffalo and Rochester services owing to heavy snow falls. Neither service, however, was seriously impaired; in fact, these slight interruptions would not be worth remarking upon if it were not the persistent habit of ignorant critics of the motor wagon to expect that, unlike any form of engineering design, it shall never suffer impairment of any kind.

The Buffalo station is equipped with a large generator and gas engine for the night load and a small generator and gas engine for the day load. It is stated upon good

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authority that the gross cost of power per wagon per month is less than five dollars. The garage is conveniently located to the principal railway depot. To such a high pitch was the organization of this station developed some time ago that the company decided to give the transportation manager freer scope for his talents in a broader field, commissioning him to raise the standard of organization in other cities where the company is operating motor wagons .

* * *

One word further in explanation of the misapplication of the wagons employed at the Buffalo station. Expert as the company's engineers are in calculating all the conditions attending transportation, they fell naturally into the error of imagining that more or less similarity existed between the services in both cities. Accordingly, after a start had been made in New York, the specifications for the wagons at that station were regarded as the standard for service in other cities. Unfortunately, however, at that time railroad transportation was lighter and train arrivals less frequent than is the case today. To fit the conditions of that period the company's engineers decided to employ vehicles capable of carrying high loads on few trips. As railroad train loading began to increase, however, and train arrivals became more frequent, the company found it necessary to adapt its system to the new order of things, and this called for motor wagons with relatively low loads performing many journeys. When the company was ready to equip the Buffalo station it placed its order in the expectation that the specifications for the New York wagons would prove suitable for the Buffalo service, Of course it was not known at the time that such wagons would be misapplied or, to put the matter in the expressive language of transportation experts, that it was more desireable to get headway than to carry high loads.

Despite this misapplication it is an open secret in well informed circles that the package delivery cost of the Adams Express Company's motor wagon service in Buffalo is very much cheaper than the package cost of any other service in the world.

A movement is on foot to establish a motor stage line between Carrizozo, N. M., and Roswell. Daily service between the two points is proposed, giving a six-hour service and connecting with El Paso & Southwestern trains both east and west. This service would make a much shorter route between Roswell and El Paso than exists at the present time.

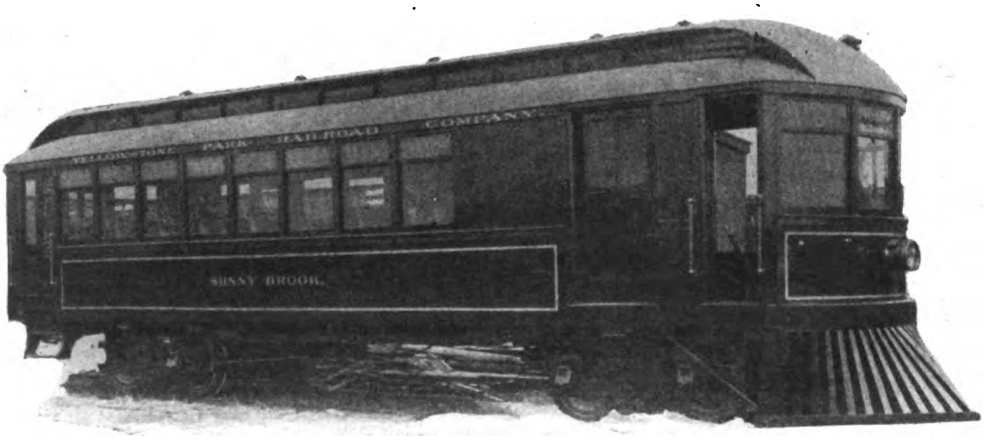
The Chattanooga Electric Light and Power Company, Chattanooga, Tenn., has purchased three motor cycles for the use of its linemen in repairing broken wires.

The service of horse drawn cabs in Paris is now in as little demand as the service of horse drawn omnibuses in London.

The authorities at Montevideo, Uraguay, are making efforts to introduce motor trucks, motor cabs and motor buses wherever the service of such vehicles can be made profitable or found practicable. The tariff charge on vehicles of this character is 50 per cent ad valorem.

The executive committee of the St. Louis salvage corps has decided upon the purchase of a motor wagon which will cost about $6,000.

The postmaster of Detroit has been authorized to make contracts for motor delivery from the main post office to all of the outlying post offices of Detroit, with the exception of the Delray and Grand River offices, beginning August 1.



Gasoline Railroad Car Built in Indianapolis

THE first motor rail car ever built in the state of Indiana left the shops of the Interstate Car Company at Indianapolis last month on its way to the Yellowstone Park, where it will be put in service carrying passengers on a short coal road which runs from Bridger to Bear Creek, Montana. The car is shown above. It is 41 feet long and is fitted with an engine which develops 50 hp. at 700 revolutions per minute. The fuel tank holds 85 gallons, the water tank 15 gallons. The car is heated from the engine cooling system. The maximum speed is 35 miles an hour. One supply of fuel is enough for 525 miles. Chain drive is employed.

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The Chicago Show

How the Industry and Buyers at Large Will be Benefited From its Conduct

ALL signs indicate that the exhibition of industrial motor vehicles to be held in Chicago during the first week of December will be crowned with success. The management is experiencing no trouble in recruiting exhibitors, and there is no doubt that when a representative selection of products is massed in the exhibition building a very vivid picture of the variety and extent of the industry will be presented.

Already space on the ground floor of the exhibition hall has been allotted to fifteen manufacturing concerns, whose eagerness in thus early taking advantage of the opportunity for making a display of their wares may be taken as indicating that a thorough industrial representation will be secured long before the hour for opening the exhibition rolls around. Some of the concerns which have been assigned to position in the show are mentioned below:

Pope Motor Car Co., Indianapolis.
Studebaker Automobile Co., South Bend, Ind.
Rapid Motor Vehicle Co., Pontiac, Mich.
Logan Construction Co., Chillicothe, Ohio.
Waltham Mfg. Co., Waltham, Mass.
The White Company, Cleveland, Ohio.
Couple-Gear Freight Wheel Co., Grand Rapids, Mich.
H. H. Franklin Mfg. Co., Syracuse, N. Y.
Mitchell Motor Car Co., Racine, Wis.
The McCrea Motor Truck Co., Cleveland, Ohio.
Knox Automobile Co., Springfield, Mass.
The Buckeye Mfg. Co., Anderson, Ohio.
Oscar Lear Auto. Co., Columbus, Ohio.
William R. Everett, Chicago, Ill.
Reliance Motor Car Co., Detroit, Mich.

* * *

Some of the more important regulations governing the conduct of the show are herewith presented:

Available Exhibits.—Exhibits shall consist exclusively, if possible, of buses and similar conveyances, designed for public use, vehicles to be used for the transportation of merchandise, fire engines and other apparatus, ambulances and other motor-driven mechanism used for other than private passenger service; but the right is reserved to assign any unoccupied space to exhibits of cars of other forms. The exhibit of accessories will be confined to articles applicable to the vehicles above described.

Character of Exhibits.—The management reserves the right to decline or prohibit any exhibit or part of an exhibit, exhibitor, or proposed exhibit, which in its opinion is not suitable to and in keeping with the character of the exhibition. This reservation concerns persons, things, conduct, printed matter, souvenirs, catalogues and all things which effect the character of the exhibition.

Division of Space.—The automobile section will embrace the entire main floor. The space will be divided lengthwise as shown by the official diagram, and the management will allot such frontage as may seem necessary to the size and characteer of an exhibit. The gallery will be devoted to exhibits of makers of and dealers in parts and accessories.

Price of Space.—The price of all space, regardless of location, will be 90 cents per square foot. This price includes suitable floor coverings, dividing railings, signs, sign hanging, wiring for current if electric signs are used, one desk and two chairs for each space, and all necessary decorations, police, watchmen and janitor service. The price does not include wiring for motors or any item except those above enumerated. The equipment will not become the property of exhibitors.

Duplicate Models Prohibited.—The management reserves the right to prohibit the exhibition of more than one sample of any model—that is to say, more than one car or chassis so nearly alike that the purpose of the exhibition might be served by the display of one of them.

Uniformity of Exhibits.—The management will so prepare the spaces that no attention on the part of the exhibitor will be necessary, except to place his exhibit in position. No decoration, electric lighting, or furniture or other material likely to destroy the uniformity of the exhibition, will be permitted to be used.

Admission Fee and Special Tickets.—The admission fee to the public will be 50 cents. To each exhibitor will be furnished, free of cost, on application to the manager in writing, a reasonable number of invitation tickets. These will be available for the use of gentlemen only and are intended for use by prospective purchasers of vehicles, their engineers, traffic managers, heads of departments, etc., who are interested or likely to become interested in the use of commercial vehicles.

* * *

The chief purpose of the show is to bring buyers, both active and prospective, into close business relations with the sellers. The sellers will naturally go wherever they can find masses of buyers. But to contrive the presence of buyers is not easy. The plans under consideration for arousing public interest in the exhibition are already well formed, and it only remains to put them into execution at the proper moment in order to guarantee that the attendance will be satisfactory. If the aisles are not thronged nobody will be disappointed, for all recognize that the purchasing capacity of those at present using or about to employ industrial motor vehicles is infinitely greater than their numbers. Only a relatively small number of business firms have transportation duties to perform. Not all of these can be expected at this day to buy motor trucks or wagons. If, however, a tolerably respectable percentage of them can be induced to attend the exhibition the commercial end of the enterprise is certain to be accomplished.

There are many reasons why representatives of all large business houses having city merchandise to transport should attend the exhibition. Only one, and that the most important, need be mentioned. The manufacturers of industrial motor vehicles are scattered throughout the country, many at considerable distance from the centers of commerce, and all more or less inconveniently located for special demonstrations of the machine's economic superiority to horse haulage. Hence, a firm which contemplates the employment of motor wagons has to choose between two courses of action in concluding a bargain. One is to send a representative roaming around the country at considerable expense, investigating and comparing the merits of the various machines upon the market before eventually making a selection. The alternative is to

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remain at home and select a machine at random, helped to a decision by the perfervid recommendations of superserviceable friends, who are always ready with advice upon matters concerning which they are profoundly ignorant. The agency distributing system not being so thoroughly organized as it is in the touring car industry, many buyers remote from circles where expert information upon merchandise motor transport is plentiful, have rashly concluded that they knew enough about the subject to warrant them in proceeding unaided to the close of a sale. The result has been the misapplication of many wagons of excellent repute

* * *

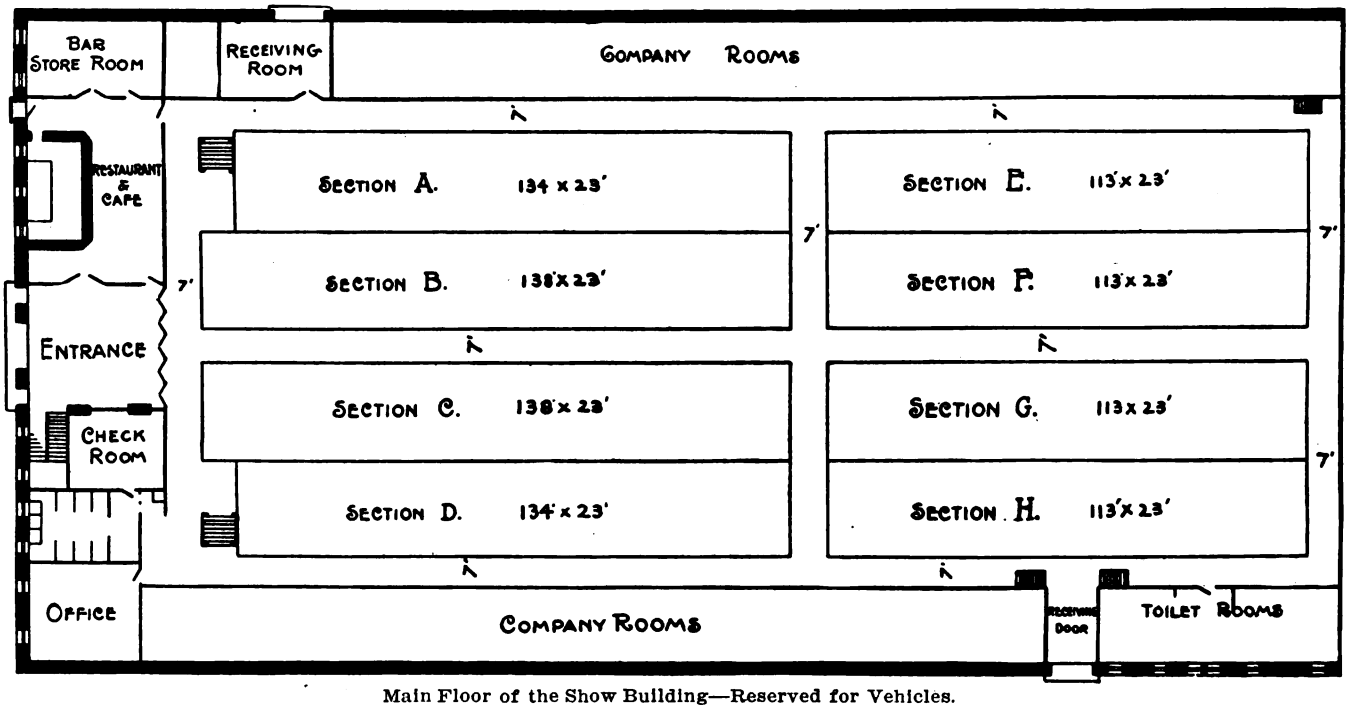
It is not easy for those unaccustomed to deal with new problems which exercise no past business experience to understand that slight differences in original calculations may frequently prove the cause of very grave administrative error. It rarely occurs to such concerns to think that the units employed in motor road transport should be matched with extreme nicety to the service in which they are to perform. The majority give but light consideration to the matter of properly adapting vehicles to service, slipping easily from the thought that as mechanical power is but intended to replace animal power one unit is almost as good as another. At a congress of industrial motor wagon manufacturers the folly of such an opinion will be quickly demonstrated. Presumably, there will always be people in the world who will not hesitate to use a crane for picking up a needle, but the majority of American merchants and manufacturers with transportation responsibilities will incline to the opinion that the closer a motor vehicle harmonizes in power, speed, weight and load capacity to the duties it will have to perform in actual service, the greater will be its economy.

All this would be evident to the most casual investigator of commercial motor vehicles if the product of every manufacturer was as catholic in character as his private views. Unfortunately, however, it is as much as one concern can do to produce more than a few types of construction in which are embodied the special engineering excellencies peculiar to the establishment. Thus, one concern makes two-ton trucks operated by gas engine power, fitted with slip gear transmission and with road wheels driven by side chains from a jackshaft, while another makes the same general type of machine, but drives through bevel gears and transmits the power by friction wheels. Both forms of construction are obviously orthodox, and each will undoubtedly prove economical if, as before mentioned, well adapted to service. But it vexes the buyer to choose between them. Again, a buyer is well disposed toward the purchase of an electric machine, but has heard of the wonderful performance of gasoline and steam vehicles. He finally falls a victim to the thought that as the range of an eletcric vehicle is limited by its battery capacity it is needless to give more than momentary consideration to its purchase. That the bulk of city transportation is well within the capacity of the electric vehicle, and that its employment is determined by other matters than its mere radius in action, are reflections that in all probability never crossed his mind,

* * *

It is now as it ever was, and as it likely ever will be, the thought uppermost in the minds of the untutored in motor merchandise transport to inquire which is the best type of vehicle. Exhibitions at which all kinds manufactured are put on view will do more than anything else to eradicate the ignorance which inspires this question. The best machine is that which is best adapted to the service in which it is employed and which is administered with the highest degree of good sense. Its source of power may be steam, gasoline or electricity, according as the needs of the service may require. No single power has a monopoly.

The industrial motor vehicle show will prove to be a school in which liberal education in the economy of the



Main Floor of the Show Building—Reserved for Vehicles.

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power wagon may be cheaply and safely acquired. Experience with the various types of machines employed during the past five or six years will there be openly related, and in the few cases where failure has been encountered the causes for it will be made plain and contrasted with the preponderating number of instances in which only success has been achieved.

The week of the show will afford the first good opportunity for studying cause and effect in mechanical road transport. Every bit of malicious gossip, passed around for the purpose of retarding or blocking the progress of the commercial motor vehicle movement, will in all probability be exhumed for the benefit of the ghouls who delight in such stories, and decently interred again. The more enduring and more comforting experiences will also be heard. The magnitude of the industry will be at once apparent, the seriousness of its aim recognized, and the reasons which have induced hard-headed business men to invest close to $18,000,000 in the purchase of machines for the moving of merchandise will be explained to the satisfaction of all inquirers. The individual who because he has yet to make his first plunge in motor wagon transportation is of the opinion that he is a pioneer in the field is likely to be disillusioned when he learns what others have been doing for the past six years.

* * *

The most practical of the lessons which the interested visitor to the show will learn will be that nothing is to be gained by delaying purchase pending the time when the art of constructing industrial motor vehicles will be more perfect than it is at the present moment. Money is not made through the employment of motor wagons because they are expressive of the highest engineering thought, but because, even at this stage of their development, their service is superior to horse haulage. Finality in their construction is not likely to be reached in our day. The best part of a century has passed since the steam locomotive was given to the world. It is still undergoing refinement.

ONE HUNDRED BUSES FOR SAN FRANCISCO

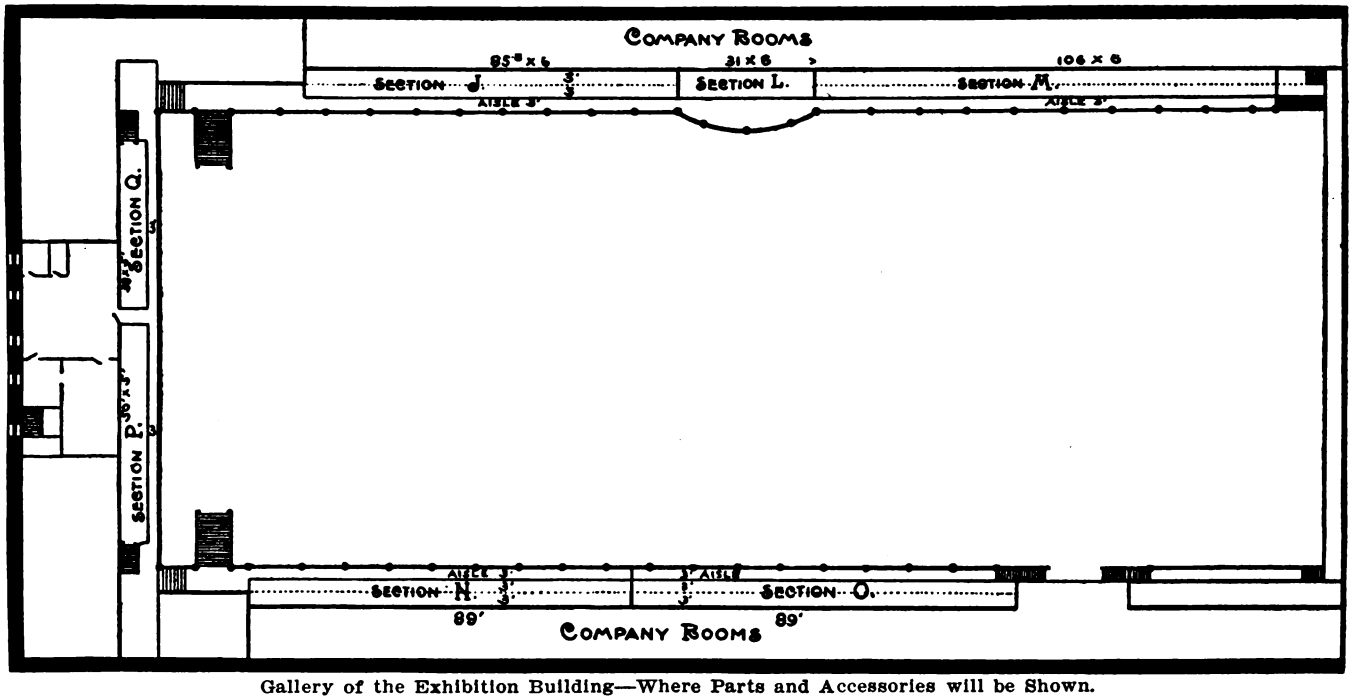
THE Western Rapid Transit Company, with capital stock of $250,000, was recently incorporated for the purpose of operating motor omnibuses on the principal streets of San Francisco. The company proposes to charge a five cent fare and expects to have its system perfectly organized within six months. Garages and repair shops to accommodate 100 passenger machines are to be erected as soon as the company gets a little further along in the development of its plans. Closed buses will be used during the winter.

The officers of the company are: G. Stephens, president; J. I. Plunkett, vice-president and general manager; W. P. Twist, secretary and treasurer; B. O. Middleton, assistant manager, and M. Sardou, consulting engineer.

REORGANIZING PARIS MOTOR BUS SERVICE

A commission has been appointed for the purpose of reorganizing the existing motor bus service in Paris. It is understood that a renewal of the expiring concession now held by the General Omnibus Company will be granted for a period of thirty years upon the condition that all its vehicles shall be motor driven and that the fare will be twenty centimes first class and fifteen centimes second class. Special service will be afforded for workmen in the winter up to 6.30 in the morning and up to 6 o'clock in the the summer, passengers paying five centimes for the whole distance or ten centimes for the return trip ticket.

One of the large manufacturing firms in France has offered to supply the 800 motor buses necessary for the Paris service, but stipulates that it shall be given two years to construct the vehicles and three years in which to erect garages and workshops.



Gallery of the Exhibition Building—Where Parts and Accessories will be Shown.

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Unfair to Bidders

Specifications for New York's Police Wagons not Drawn With Sufficient Freedom

VERY much to their chagrin, many manufacturers are prevented from bidding on the construction of municipal motor vehicles by reason of the fact that the specifications are such as to practically compel the selection of a product issuing from a given establishment.

While city officials undoubtedly possess the right to minutely prescribe every detail of the machines they are willing to pay for, this authority is granted upon the assumption that they are sufficiently well informed in matters mechanical to decide between the advantages claimed for various competing forms of engineering design. Lacking this skill, which by the way is rarely found except in the most talented and broad-minded engineers, a municipal executive who takes advantage of his privilege and gives no latitude to constructors, runs the risk, to put it mildly, of being criticized for practicing favoritism.

* * *

The history of the application of motor vehicles to municipal service is not so old, or the experience it records so voluminous or reliable, as to warrant department chiefs in arbitrarily denominating the specific character of the materials or engineering design which shall be employed in assembling machines for city use. And yet, despite the soundness of this observation, we find the police commissioner of the city of New York, who desires to purchase two motor patrol wagons, one gasoline and one electric, writing specifications for their construction with as much assurance as if his orders represented the last word upon the subject of motor wagon engineering. A study of the documents in which the specifications for one of these vehicles are contained reveals the fact that the commissioner, notwithstanding his fluent use of technical phraseology, has given us an accurate word picture of the construction of a wagon which is only made in one establishment in the country. This naturally gives rise to the suspicion that he was coached by an agent of the concern in question and fell a victim to its commercial subtlety. Perhaps it is only a coincidence.

* * *

It is remarkable that the commissioner, who is scrupulously particular about the construction of the frame, springs, wheels, motor, battery, method of steering, speed, mileage, and equipment of the electric vehicle, should have forgotten to cover such matters as wagon efficiency, lineal and lateral dimensions, and maintenance cost. Such caution would have been but logical in one who obviously intended, by the exactness of the other specifications, to see that the municipality was getting value for its money.

Without further preliminary, we present the official specifications for both wagons:

Electric Police Patrol Wagon

FRAME: Four-inch channel iron.

SPRINGS: Half elliptic front and rear.

WHEELS: Artillery type, hickory spokes, oak felloe, fourteen spokes, roller bearing hubs.

TIRES: Solid rubber, 32 inches by 4 inches front and rear.

MOTOR: Single G. E. type, suspended from frame in cradle with countershaft as one unit, guaranteeing perfect alignment at all times; countershaft on roller bearings.

DRIVE: First reduction—Morse silent chain; second reduction—double roller chain to rear wheels..

BATTERY: Exide type, suspended in steel cradle and arranged so as to be removable from each side of vehicle.

BRAKES: Internal expansion, leather faced on each rear wheel.

STEERING: Vertical pinion and sector.

SPEED: Twelve miles per hour.

MILEAGE: Thirty miles full load on hard level asphalt; forty-five miles half way loaded and return empty; fifty-five miles empty full distance.

BODY: To be finished in first-class workmanlike manner, with first quality material of such color and with such lettering and striping as directed; to have a carrying capacity of ten people inside, two besides the driver on front seat, with a step on the rear wide enough for two if necessary; solid polished brass rail around the edge of the driver's seat and down the back of the vehicle to the rear step as a guide and handle.

MATS: Perforated mat to fit driver's toe board, and 3-16 inch corrugated rubber mat fastened to floor inside between seat legs and to run full length of body, also on rear step.

APRONS: Storm apron for driver to fit over dash, to be made of best quality black oil duck canvas.

CURTAINS: Provide curtains on both sides and across front of body, complete, to be properly fastened and to have roll-up straps and eyes to secure them in place when not in use; curtains across front at back of driver's seat to contain two curtain lights of proper dimensions and put in so that driver can look into wagon when curtains are down.

LAMPS: Two standard electric lamps, green ground on sides with white numbers, with red rear eye. An emergency light with 10 feet of flexible cord rolled up and hung in the roof of the wagon for lighting the interior or examining the running gear when necessary.

LANTERNS: One brass hand lantern of approved make, with brass holder to be provided complete, and springs of holder leather covered.

SEATS: Inside seats to be natural wood, made extra strong and well put together, and have hinged legs fitting securely into sockets in the floor; these legs to be connected in such a way that they may be tripped and the seats instantly lowered to a vertical position from the outside or rear of the vehicle. The back of driver's seat to be cushioned in leather, biscuit pattern. Leather covered cushion is provided for driver's seat.

STRETCHERS: Two stretcher poles as provided for each wagon made of straight grained ash with hand hold at each end, 2 inches in diameter and 7 feet 4 inches long. Stretcher made of enameled rubber cloth provided for each wagon.

ROOF: Roof boards are to be of clear, well seasoned 8 by ⅛ by ¼-inch white pine, finished on the inside in natural wood color and varnish. Entire roof to be covered on the outside with best quality black oil duck canvas.

WIRE SCREENS: To be provided to the sides and across the front of the body and secured so they can be easily removed if necessary. No. 12 wire—½-inch mesh.

LOCKER: To be provided under right side of driver's seat and arranged to draw forward; also to have two medicine drawers, each 8 inches deep, 18¾ inches long and 4½ inches high; lockers also to be provided under rear part

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of seat and accessible from the inside of the wagon, extending the complete width of the wagon, and to be 12 inches deep and 10 inches long.

GONG: Brass, New Departure, 11-inch fire gong, making fifteen taps at one stroke, with foot pressure for driver to be on right side of center, under footboard and under control driver's foot.

Gasoline Police Patrol Wagon

FRAME: Five-inch rolled channel section, thoroughly braced with cross members and gusset plates.

SPRINGS: Half elliptic front and rear.

WHEELS: Thirty-two inches diameter, oak felloe, hickory spokes, roller bearing hubs.

TIRES: Four-inch solid front, 5-inch solid rear, side wire type.

BRAKES: Internal expansion brake, leather faced on each rear wheel. Emergency brake on countershaft.

ENGINE: Twenty-four b. h. p., double-cylinder opposed, or four-cylinder vertical, water cooled.

IGNITION: Jump spark, twenty-four dry cells connected in series multiple with one complete, reserve set operated from two-point switch.

LUBRICATION: Oil supplied by gear driven mechanical oiler.

WATER COOLING SYSTEM: Tubular radiator, containing ample cooling surface in front, positive driven gear pump of ample size.

CLUTCH: Cone, or multiple disc type.

TRANSMISSION: Sliding gear, three forward speeds and one reverse speed, direct on high gear.

DRIVE: Double side roller chain to rear wheels.

CONTROL: Steering post control for throttle and spark, foot pedal control for clutch.

STEERING: Pinion and sector.

WEIGHT: Not over 5,200 pounds.

BODY: To be finished in first-class workmanlike manner with first quality material of such color and with such lettering and striping as directed by the commissioner of police. To have a carrying capacity of ten people inside, two besides the driver on front seat, with a step on the rear wide enough for two, if necessary.

* * *

After attentively reading the specifications for these two machines it will occur to the well informed reader to inquire why, in view of the irreconcilable opinions held by mechanical experts concerning many features of construction which are minutely detailed in the commissioner's notice to manufacturers, unhesitating selection should have been made of materials and design. In effect, the specifications convey the impression that no other materials or design are worthy of consideration.

It would have been more in harmony with municipal precedent if the specifications had been drawn with freedom, more especially as eventually the award for construction must be given to the lowest bidder. The commissioner would obtain a wider choice of products if he had not fixed limits to the engineering design.

He is on safer ground when dealing with such subjects as brass rails, toe board mats, storm aprons, curtains, lamps, lanterns, seats, stretchers, lockers, gongs, wheel striping, lettering, painting, gilding, upholstery, and the like. It is only when he strays into the realm of engineering that he gets lost.

The Commercial Club of Webb City, Mo., is actively urging the council to purchase a motor chemical wagon.

IMPROVING MILWAUKEE'S MAIL SERVICE

MILWAUKEE'S motor postal wagon service is to be improved by the commissioning of three more collection wagous this month, making five in all. The new machines will collect and deliver mail from and to the sub-stations only. When they are in operation the service of the cars first employed will be confined exclusively to making collections from outlying boxes. The new machines are identical in form and size with those already in service, except that the roof is a little lower, owing to the fact that it is not necessary to have a clerk in the machine to sort mail. When all these cars are in operation the five sub-stations will have eight deliveries daily instead of the three they have at present, which in emergencies is sometimes raised to six.

RURAL MAIL PROGRESS

RURAL mail carriers everywhere throughout the country are rapidly availing themselves of the permission to make use of automobiles in postal delivery work. The decision of the government to increase the salaries of the carriers has played no unimportant part in the eagerness to acquire machines. The cost of operating and maintaining a light machine of the runabout type has often been proven to be less costly than the operation and maintenance of a horse drawn rig, providing the mileage of the machine is not made unduly high. Rural mail carriers in the following towns have recently invested their spare cash in automobiles: Charleston, S. C; New London, Wis; Billett, Ill; Vincennes, Ind; Fergus Falls, Minn; Shelbyville, Ind; Pittsburg, Kan.

VEHICLES FOR TRAVELING SALESMEN

ONE of the noteworthy features of the trials for industrial motor vehicles recently held in France was the performance of three machines designed for use by traveling salesmen. These vehicles escaped penalty of any kind and, from the fact that their fuel was alcohol, attracted much attention in circles where a prejudice exists against the employment of gasoline owing to its high cost. So deep was the impression created by the performance of these cars that it is now proposed to immediately promote a series of trials which will more strikingly establish their advantages. The plans for these trials contemplate competitive conditions while the vehicles travel 5,500 miles. The bodies are to be constructed to carry two passengers who are to be protected from inclement weather. Each machine is to have a compartment capable of carrying samples with dimensions fixed at 30 x 30 x 20 inches. The merchandise load is to be 330 pounds. The total weight of the vehicle including passengers and merchandise must not exceed 2,425 pounds.

The postal department has authorized the employment of motor wagons in the collection of mails at Philadelphia.

Motor bus service between Pueblo and Beulah, Colo., has been established by the Pueblo Automobile Company. Two machines are operated daily.

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Defeat Turned to Victory

Philadelphia's Motor Bus Ordinance Vetoed by Mayor; a New Measure Passed and Signed

GREATLY to the surprise of those who have closely followed the history of the attempt being made to furnish motor bus transportation in Philadelphia, the mayor of that city vetoed the enabling measure which had passed both branches of the council.

This extraordinary action the chief executive justified upon the plea that the ordinance was "too general in its terms." A year ago when the mayor's opinion was sought concerning the first measure framed for the purpose of enabling motor buses to operate, he checked its progress in council by declaring it to be "too specific in its terms." The mayor is hard to please. Both of his decisions, however, were much admired by the street railway operators whose inadequate service occasions public interest in motor bus transportation. The ordinance that passed was made general and not specific because of a decision of the city solicitor, who ruled that a measure specifying routes would be illegal. In his veto message the mayor said:

"The reasons for my disapproval of this ordinance are that it is too general and that its enactment would permit of obtaining blanket privileges without giving the desired relief. An ordinance authorizing motor bus lines along specified routes might in a great measure relieve the present congestion of street railway traffic. A line, for instance, along Broad street from League Island to the northern city line, with ample buses operated, it seems to me, might bring relief in north and south traffic. But for the city to permit the selection of routes at will of any parties desiring to utilize streets that are now covered by tracks in inadvisable, and therefore I do not approve of this ordinance."

* * *

The mayor's subsequent criticisms were not quite so temperate and give rise to the suspicion that his motive in exercising the veto power was prompted by other considerations than he names in his message. He is reported as saying:

"If I have made a mistake in this matter I shall be glad to rectify it. However, I still think my criticism of the ordinance is correct. Who wants those double-decked, humped-backed things on the streets, anyhow? The city ought to have specific supervision over them. We should determine their appearance, character and color. The streets are too crowded now, and having buses run up and down at will would make things much worse. They certainly can't get on the Parkway. My idea of that is to give people some place to drive where they won't have to mix in with ash-carts and ice wagons and similar unsightly vehicles."

The mayor's solicitude for the appearance of the vehicles in which the citizens of Philadelphia ride to their daily labors would be more appreciated if it could be employed to officially denounce the noisy, dirty and crowded street cars. A community which is compelled to pay for strap-hanging transportation privileges will endure most any kind of a vehicle which furnishes them with seats. The spinal curvature and pulchritude of public service vehicles are unimportant factors alongside the necessity of getting what you pay for.

* * *

As a result of the agitation which ensued when the mayor vetoed the measure, a new ordinance providing for the operation of motor buses was introduced in council. This new measure provides that machines may be operated on Broad street, between League Island and the city limits, and on the full length of Diamond street. It also permits the vehicles the use of streets within three squares of the Auto Transit Company's proposed terminals, and in case of blockades the use of the nearest parallel street.

The ordinance which the mayor signed curiously differs from the one which for months was considered by councils, and finally vetoed by him, in that it does not permit any street to be used that is now occupied by street railway tracks. It would be interesting to speculate upon the behavior of the mayor if a condition should arise that would make it imperative for the street railway company to operate motor buses as feeders to the main arteries of its system, or as auxiliaries along those arteries. The cry of congested vehicle traffic has always been raised whenever the motor bus appears as a competitor to the street railway or threatens to divert a portion of its profitable traffic. Obviously, it is not good policy to unnecessarily crowd the streets by promiscuously granting special traffic privileges, even though these privileges are claimed in the name of the people and for the alleviation of their physical distress. On the other hand, it is equally bad policy to condemn the inhabitants of a metropolitan city to endure the reigning conditions in street car transportation.

* * *

While the franchise which with so much difficulty has been wrested from the municipal authorities of Philadelphia may not be of much commercial value at the present moment, it can hardly be overlooked that as the buses give a good account of themselves pressure will be brought upon the council to permit more extensive operations. It is of the utmost importance, therefore, that the company undertaking this public service shall exert itself to see that the system is not permitted to show the least sign of weakness. Punctuality, and a liberal policy which will provide for the accommodation of patrons as the popularity of the vehicles increases, should be the keynotes of the administration. Breakdowns, from whatever cause, should be as few as possible, a condition that can only be created by an intimate knowledge of the work in hand and a genuine desire to overcome all obstacles, regardless of the financial hazard in doing so. Motor bus service is on trial in Philadelphia.

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The Farmobile, Showing Power Plant and Method of Winding Cable on Drum. Henry Ford, Who is Deeply Interested in the Adaptation of the Automobile Principle to Agricultural Operations, at the Wheel.

Machine for Farm Work

Employed as a Tractor it Operates Farm Implements With Very Remarkable Economy

THE question of adapting the automobile to the propulsion of agricultural implements has engaged serious attention for some time, and while good results have been secured in certain special lines where the machine operates over a fairly good surface, such, for example, as in the operation of road tractors for hauling trailers, or power-driven lawn mowers, success in operating plows has not been unqualified.

The chief difficulty has been to secure the necessary traction of the wheels on the ground. Ribbed wheels do not have the necessary gripping effect unless they are held down by enormous weight, and even then the resistance of the load is often sufficient to cause the tractor wheels to simply gouge out the ground as they revolve without moving ahead. Then there is the additional expense of construction due to the great weight of the tractor, to say nothing of the cost of propelling this enormous and superfluous dead weight.

These difficulties have been absolutely overcome in the machine called the Farmobile. The system of propulsion consists in employing an inert wire cable which lies upon the ground and extends across the field, the ends of the cable being secured.

The car is equipped with a pair of drums which are operated by a Frayer-Miller four-cylinder 24 hp. gasoline engine. The car stands over the cable, and the cable passes with a few turns over the drums so that as they revolve they wind along the cable and draw the car at a proportionate speed. At each end of the car is a tension device comprising a pair of positively driven rolls between which the cable passes, the rolls pressing against the cable which keeps the cable taut between the tension devices and the drums, so that the cable cannot loosen its coil on the drums.

As the cable has several coils on both drums, and the coils cannot possibly slip, and as the drums are positively driven, it will be readily seen that in operation the car is bound to travel and pull its load, and the load may be as great as the engine has power to pull.

And right here the vital characteristic of the machine displays itself, and that its quality of steady, powerful and inexorable onward travel, indifferent to the

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quality of the ground, rolling over a swampy hole, or loose sand, or smooth level ground with the greatest ease, over places where a traction engine would sink to the hubs.

* * *

Without seeing the Farmobile actually at work, a most natural question is: "But as the machine has to run along the cable is it not a great deal of trouble to shift it each time the machine travels across the field?" In use the cable takes care of itself and shifts itself to accommodate the path in which the machine is steered; and here is another unique and valuable feature without which the Farmobile would fall short of the absolute success it has achieved. Each end of the cable is fastened to a pulley, and the pulley rides along a cable arranged transversely to the propelling cable. The machine is provided with a steering wheel which controls the angular position of the front wheels similarly to an automobile. When the machine is steered so that it rides along the propelling cable in a line at right angles to the end cable, the pulley lies still on the end cable; but when the machine is steered to the right or left, for example, to avoid obstruction, the machine will draw the propelling cable into an angle with the end cable, whereupon the pulley naturally rolls along, carrying its end of the main cable to a point directly opposite the machine. In traveling back and forth across the field the cable is shifted in this manner. This shifting action does not actually occur until the machine has approached somewhat close to the pulley, for when there is a long amount of the main cable on the tension side the weight of the cable and friction of moving it sideways on the ground prevents such movement.

At all times, however, a short amount of cable immediately in front of the machine always swings to the right or left when necessary to suit the steering of the machine.

The machine is equipped with gearing for reversing the drums to propel the machine backward along the cable, but the steering is difficult in such method of backward travel, and in use the machine is turned around at each end of the field, so that it travels forward each time it traverses the field. To accommodate this, and to obviate the necessity of disengaging the cable from the drums, or of swinging the whole cable end for end, the main cable near each end has a section which is separable from the the cable and forms a detachable link.

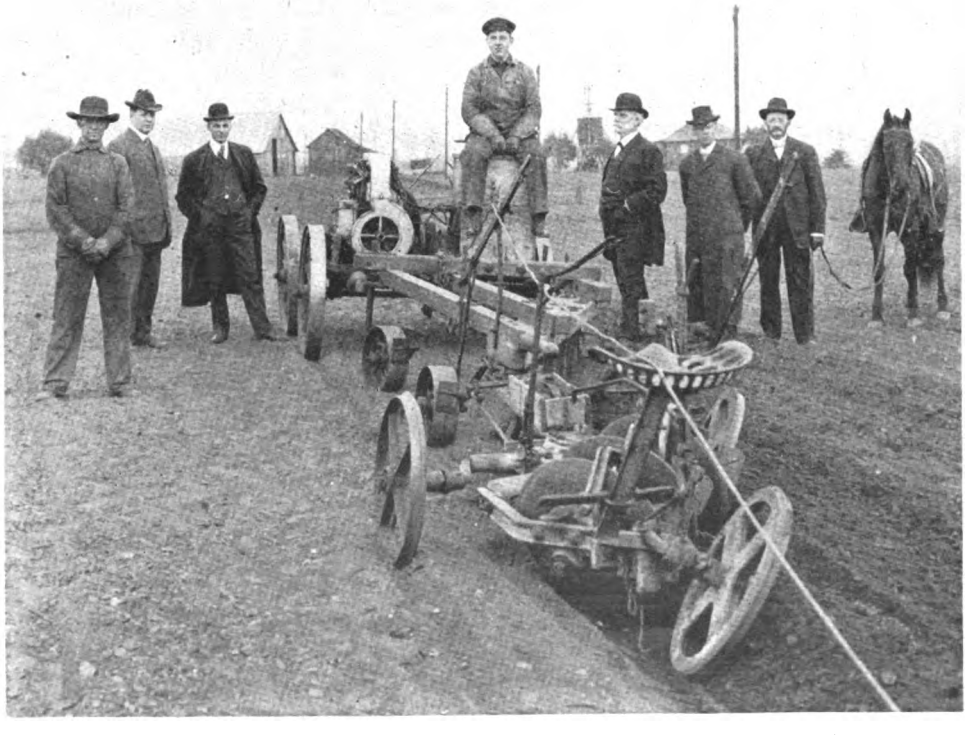
The machine when at either end of the main cable stands over the separable section or link, the latter then being wound around the drums and extending at each end somewhat beyond the machine. Then by unhooking both ends of the short section from the main cable, the machine is turned around, taking the section with it, and the section thus reversed by the machine is hooked into position again in the main cable, whereupon the machine can proceed forward. The end cables are fastened to permanent stakes, of which there is a series at each end of the field. This permits an end cable of convenient length to be used which can be easily shifted from one pair of stakes to another from time to time.

The machine is provided with simple gearing, which may be thrown in by a clutch for driving the machine through its own wheels without the cable when desired.

* * *

On account of the unique method of propulsion the machine, though having an ample strength, weighs only 2,500 pounds, and with a four-cylinder, 24 hp. air cooled engine, pulls with ease two Fresno gang plows turning twenty acres a day, plowing, seeding and harrowing, if desired, in the one operation.

By reason of the very light weight and great power as a tractor the Farmobile will do all ordinary work, cul-



The Farmobile, Operated by 24 h. p. Air-Cooled Engine, Which Pulls Two Gang Plows, Turning Twenty Acres in a Day.

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tivate, run mowers, draw loaded wagons to or from market, or other effort requiring the services of not more than six horses. When operating on the cable it does the work of eighteen horses, with a reserve capacity of double this number.

A few of the advantages of the Farmobile are herewith presented from the literature issued by its makers, the Farmobile Company, of Los Angeles, Cal.: It is the only machine of its kind in the world; it will do all the work on a farm usually done by horses at a saving of from 100 to 300 per cent; the total cost of operation is less than $6 per day; It will plow, harrow and seed twenty acres per day; it will pump water, draw the harvester and mower, run the thresher, and haul the product to market; it dispenses with a large number of horses and does not need feed when not working.

LONDON'S BUSES NOW NUMBER 977

DURING the early part of July a count of London's motor buses showed that 977 vehicles were in active operation. The distribution was as follows:

Vanguard Motor Bus Co.	343
London Road Car Co.	188
London General Omnibus Co.	184
London Power Omnibus Co.	67
Great Eastern Motor Omnibus Co.	54
Thomas Tilling	35
Associated Omnibus Co.	29
Star Omnibus Co.	24
Birch Bros.	15
Miscellaneous Owners	38
Total	977

MAIL WAGONS WITHDRAWN FROM SERVICE

THE firm operating the motor collection wagons which for some time past have been at the command of the postal authorities in Baltimore has withdrawn the vehicles from service with the consent of the government, which has annulled the contract. The Washington authorities state that the service was satisfactory in every particular and will endeavor to find some other establishment with which the contract for automobile service can be renewed. Pay for the service is not very liberal.

ANOTHER FIRE LOSS

THIRTY electric cabs belonging to the New York Transportation Company were recently destroyed in a fire which burned the car barn of the New York City Railway at Madison avenue and 86th street. This is the second time within six months that loss of this character has been visited upon the New York Transportation Company. The vehicles were stored on the second floor of the barn owing to the fact that the fire which recently destroyed part of the transportation company's premises was of such recent origin as to prevent the company from rebuilding and caring for all of its own vehicles. Some of the burned machines had been damaged at the fire six months ago. The motors and batteries had been removed from many of the machines.

HOTEL MOTOR CAB SERVICE

PROPRIETORS of the leading hotels in metropolitan cities are beginning to appreciate the value of an up-to-date cab service as a feature of hotel organization. The new Plaza hotel in New York, which is on the eve of completion, will be the first institution of its kind in the country to operate its own motor cab service, fifty gasoline machines having been ordered. We regret to say that these vehicles are to be imported. They will be fitted with taximeters, but in many respects will differ from the ordinary taximeter motor cab. They will be reserved for the exclusive use of the guests of the Plaza. They will be commissioned October 1st, which is the day set for the opening of the hotels.

STEAM AMBULANCES FOR ARMY POSTS

IT is reported that Fort Riley, Fort Leavenworth, and some of the other large army posts, are soon to be equipped with motor ambulances capable of carrying ten passengers inside and two on the front seat. They will cost about $4,000 apiece. As the army authorities have evinced a preference for steam as a motive power for this class of work it is believed that the purchases referred to will be steam vehicles, with horse power rated at 30 and with speed ranging from 40 to 45 miles an hour.

Arrangements have been made for the operation of motor buses between Kirkland and Fall City, Wash.

The Farmobile, Drawing Two Plows, One of Which Turns Up the Ground for a Width of Seven Feet.

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Heavy Vehicle Trials

Army Authorities Interested in Result of Unusually Severe Tests Recently Concluded in France

DESPITE the unprecedented and unnecessary severity of the conditions governing the public trials of heavy French industrial motor vehicles, recently conducted by the National Automobile Club and supervised by representatives of the army, twelve out of forty-one machines entered qualified for the final or consumption test after traveling 2,500 miles in twenty successive days. The number qualifying would have been much greater if permission had been given to effect simple repairs which in commercial service would not require more than a few moments attention. As it was slight derangements, which in commercial practice would be quickly remedied, were the cause of many a disqualification. Each day's journey varied from 90 to 120 miles, according to the classes. The trials took place on the roads in and around Paris, the buses making the longest journeys. At the outset there was a noticeable tendency among drivers to speed their machines faster than good judgment would endorse, or than the regulations permitted. This was done in order to gain the benefit of whatever advertisement might follow from the announcement that certain vehicles in certain classes were first to reach a given point of destination. As soon as this custom began to spread and interfere with the conclusions which the civil and military juries hope to draw from the trials, the regulations governing speed were strictly enforced and thereafter speed in excess of that prescribed by the rules was followed by disqualification. This incident should convey to users of commercial motor vehicles how unimportant is mere speed when compared with other qualities which make for the permanence of the industrial motor vehicle.

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In the accompanying table will be found the list of vehicles, in the various classes, which were officially recognized as having escaped penalties, together with their useful loads, gross weight, fuel consumption and nature of fuel employed:

Some idea of the severity of the trials may be gathered from the fact that the crank case, gear box, and other parts were sealed as a guarantee that the vehicles would perform in the manner claimed by their makers. Doubtless this action was taken at the suggestion of the military authorities, who through the army staff corps co-operated with the automobile club. Military experts, from the minister of war down, were intensely interested in the outcome of the trials, letting it be understood that a number of the vehicles which performed with greatest distinction would be purchased for army transport service. To further stimulate manufacturers to do their best the war minister, a few days before the trials, publicly stated that upon the results obtained would depend the immediate introduction of motor vehicles into the French army upon a scale of magnitude equal to its needs. "I know," he observed upon this occasion, "that these trials are going to be real tests of endurance, and it is certain that those who surmount the attending difficulties will be able to render us real service in many instances, particularly in case of war."

That this was not merely rhetorical grace became apparent as the trials progressed. A hundred members of the army staff corps, constituting a military jury, were keen observers of every incident which occured. Military interest in motor road transport was further shown when the cavalcade was three times formed in line, the driver of each vehicle being given instructions to maintain a fixed position with relation to the vehicle in front of him, and the whole line maneuvered as it would be if under strict military control, the motor buses leading the way as they would be required to do in transporting troops.

Undoubtedly it was the military interest in the trials which suggested that they be made as severe as possible. It was absurd, however, to carry matters to such a length as to disqualify a wagon for inability of the operator to remove a bolt which was giving trouble, as was actually done upon one occasion. Automobiles, like every other form of machinery, require attention or they will suffer

Make	Useful Load	Gross Load	Fuel Cons'p'n	Fuel
SECOND CLASS (vehicles carrying between 1100 and 4400 pounds)				
1 Delahaye	3100 lbs.	6800 lbs.	8.76 gals.	Gasoline
2 Aries	1200 "	3800 "		Gasoline
THIRD CLASS (vehicles carrying between 4400 and 6600 pounds)				
1 Darracq — Serpollet	6150 lbs.	13,070 lbs.	16.3 gals.	Heavy Oil and Gasoline
2 Darracq — Serpollet	6150 "	13,110 "	15.8 "	Heavy Oil, Gasoline and Alcohol
3 Turgan	6400 "	12,830 "	10.0 "	Gasoline
4 Panhard — Levassor	5300 "	12,470 "	9.5 "	Gasoline
FOURTH CLASS (vehicles carrying over 6600 pounds)				
1 DeDion — Bonton	6750 lbs.	13,480 lbs.	10.3 gals.	Gasoline
2 Darracq — Serpollet	7800 "	16,050 "	21.5 "	Heavy Oil, Gasoline and Alcohol
3 Darracq — Serpollet	7800 "	16,195 "	21.7 "	Heavy Oil, Gasoline and Alcohol
4 Mors	6780 "	15,710 "	11.6 "	Gasoline
FIFTH CLASS (public service vehicles carrying at least 10 passengers)				
1 Aries	1800 lbs.	5,750 "	8.76 gals.	Gasoline
2 Brillie (6 wh'ls)	3400 "	10,880 "	13.3 "	Alcohol

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from a variety of troubles over which the operator has no control. Even stars fly from their course once in a while, which was hardly calculated in the plan of creation.

* * *

Except in the factories where the twelve successful vehicles were built there is much dissatisfaction expressed over the conditions governing the trials. While there is no desire to minimize the splendid performance of the successful vehicles, it is pointed out that a twenty-day test but very imperfectly indicates the manner in which a vehicle will run for a long period of years. The repair account does not begin to become prominent until the machine has been in service for at least a year, providing it is of ordinarily sound construction. It is quite possible therefore, that at the end of a twenty day test a vehicle which developed no weakness would still be no better than one which was disqualified for some trivial cause. Brilliant first performance is not a reliable sign of subsequent behavior.

. The impression is firmly rooted among French manufacturers of industrial motor vehicles that if trials must be conducted for the purpose of demonstrating utility, roadside repairs of minor character must be tolerated, even if the time and expense required to remedy these involuntary stoppages have to be charged against the vehicles as penalties in summing up for the final awards. So widespread is the dissatisfaction with the severity of the trials just concluded that it is extremely doubtful if manufacturers will lend encouragement to another series of trials so inelastic. It is obvious, of course, that trials conducted in midsummer are parlor exercises compared to what they would be if they were held in the rigorous months of winter. If, therefore, the French military authorities propose to ascertain all that a motor vehicle is capable of enduring it will be necessary to supplement the recent trials with others which indicate the behavior of the vehicles under adverse road and weather conditions.

* * *

It is highly creditable to the French industry that of the forty-one competing vehicles only three were compelled to withdraw from downright inability to continue, one from the breaking of a spring road wheel, another from collision with a street car, and a motor bus which was generally performing in a very unsatisfactory manner. Many were disqualified through late arrival at the point of destination, but to take the edge off any official criticism which might be made of their unworthiness were unofficially kept in the running.

The Winner in Class 2, for Vehicles Carrying Between 1100 and 4400 Pounds. The Useful Load of the Machine at the Top is 1200 Pounds. The Useful Load of the Lower Vehicle is 3100 Pounds.

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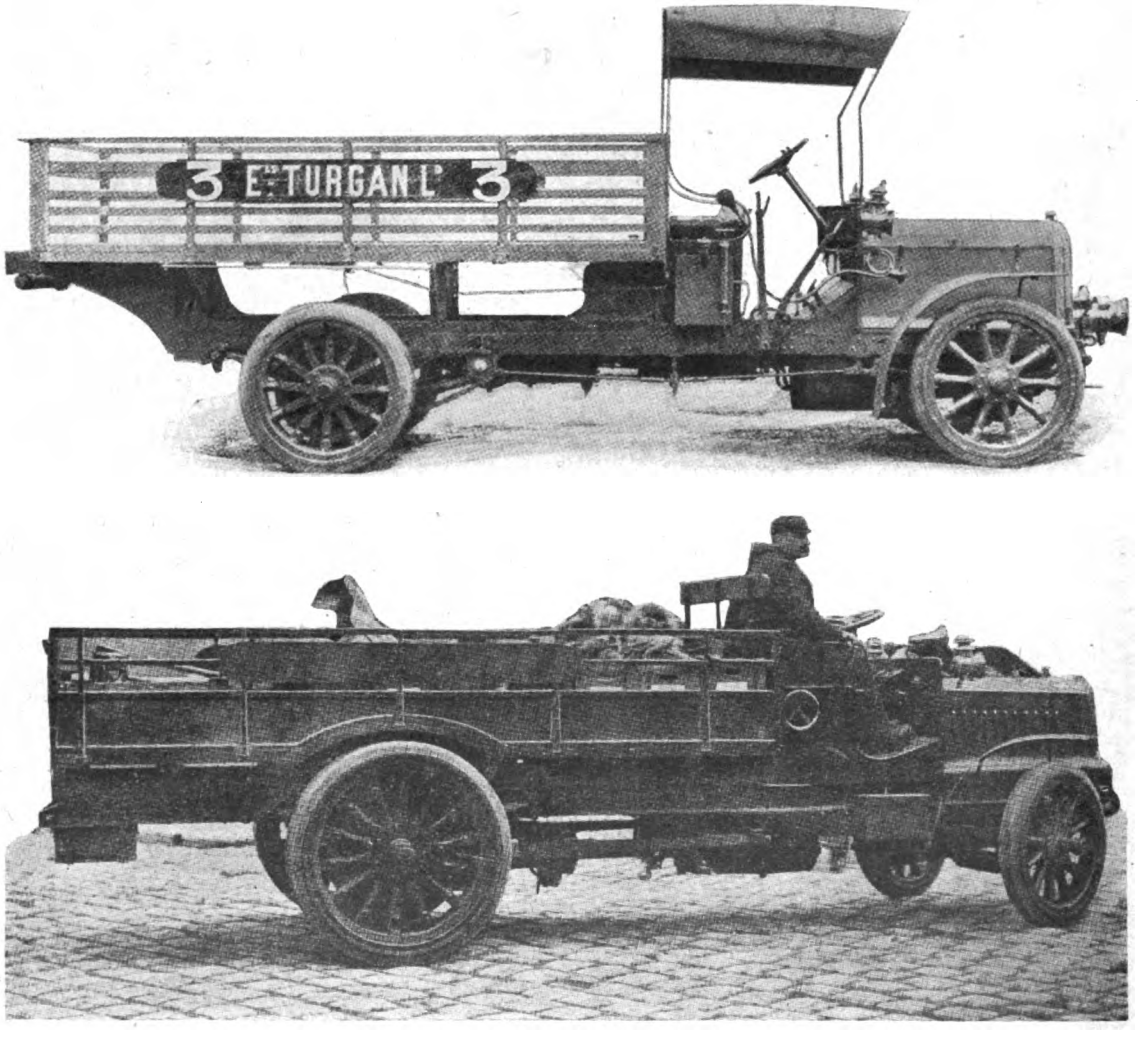
In considering these trials, their worth and the necessity for them, it must not be overlooked that France as a nation follows very far behind the United States and Great Britain in the development of industrial motor road transport. She is to the front with motor cabs, but with all else which pertains to industrial motor vehicle development, she is a laggard. Excluding cabs and buses, there are not 1,000 commercial motor vehicles employed in France. France is the last of the great automobile producing nations to become interested in this particular development, notwithstanding ten years ago she was among the first to give recognition to the importance of such work by holding public trials. The unpreparedness of the commercial world, the backward state of the art of automobile building, and the prevailing inclination to first popularize the automobile for pleasure, all contributed to the retardation.

Although much importance is attached to the fact that all of the competing vehicles carried full loads, and that some of them were overloaded, it is certain that all of them were favored in this respect. The choice of a load, a matter which counts heavily in commercial practice, was left to the contestants. None of the vehicles carried lumber, coal, sand or materials which in commercial life are known to be productive of unusually heavy vehicle wear.

* * *

The fuel consumption trials consisted of a run of 62 miles for the heavy vehicles and 93 miles for the light wagons and motor buses. The variety of fuels used made these trials interesting. In order that intelligent comparison could be made of the results obtained official prices were established for the various fuels, gasoline selling at 24 cents per gallon, denatured alcohol at the same price, and petroleum at 13 cents per gallon.One of the competing vehicles used napthaline as a fuel, which costs slightly less than 8 cents a gallon. This fuel, however, proved to be a frequent source of trouble. The purpose of the fuel test was to determine the fuel cost for a given amount of work done at a given speed by vehicles of given ratings.

From the table it will be observed that the machines which used heavy oil as fuel were charged with a very high consumption. By remembering that such fuel cost less than gasoline erroneous conclusions are not likely to drawn from the published results. In comparing useful load with total weight, in order to ascertain wagon efficiency, it will be observed that there was considerable variance from the plan to have useful load and dead weight appear in the ratio of one to one. It is distinctly grati-



Two Winners in Class 3, for Vehicles Carrying Between 4400 and 6600 Pounds. The Useful Load of the Mac hine at the Top is 6400 Pounds. The Useful Load of the Lower Vehicle, Made by Panhard-Levassor, is 5300 Pounds.

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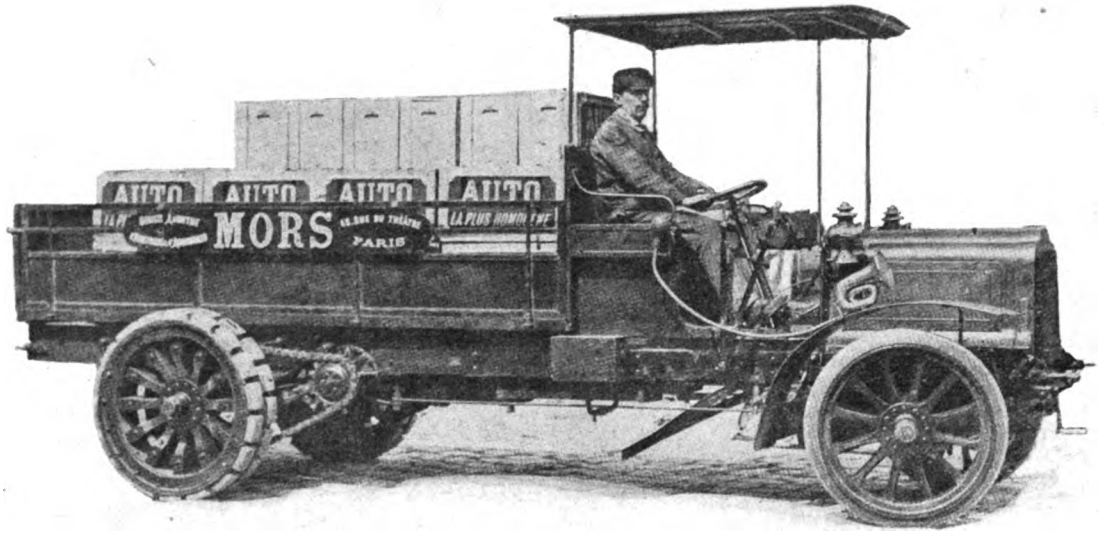
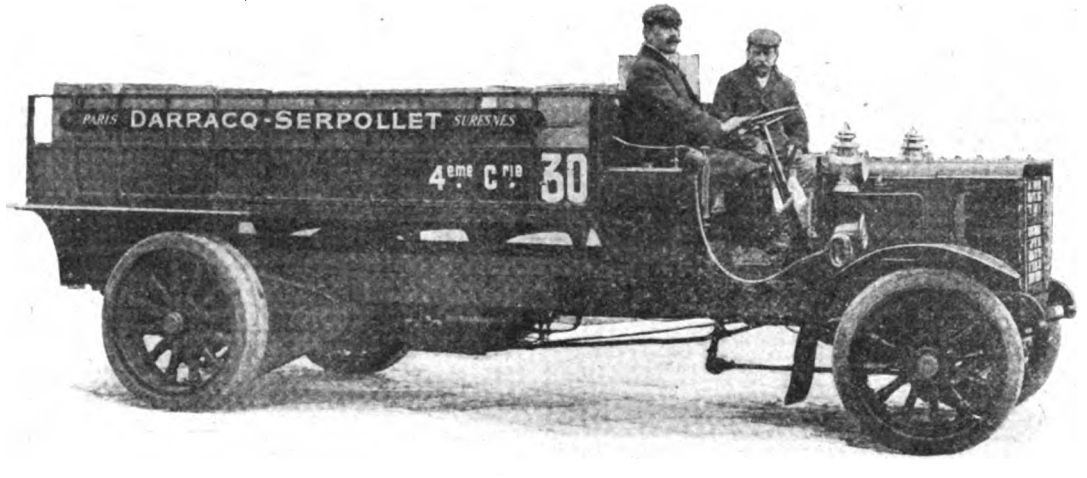
One of the Winners in Class 4, for Vehicles Carrying Over 6600 Pounds. Its Useful Load is 6750 Pounds.



Another Winner in Class 4. Its Useful Load is 6780 Pounds.



Steam Vehicle Successful in Class 4. Its Useful Load is 7800 pounds.

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fying to observe that in the majority of cases the vehicles had something to spare over and above the official requirement in the matter of efficiency, the motor buses being the only machines in which the disproportion between useful load and dead weight is glaringly evident. The peculiar character of motor bus service, the necessity for heavy top hamper and interior construction designed for the physical convenience of passengers, all supply causes for this disparity. Parenthetically it may be remarked that the public service machines entered in the trials performed with less credit than any other class of vehicle.

Three light machines, which might be used interchangeablly as motor cabs or for traveling salesmen, accompanied the heavier vehicles on each day's travel.Their fuel was alcohol. They performed with the utmost credit and unofficially were recognized as having escaped penalties.

* * *

Maximum and minimum speeds were fixed for the vehicles of all classes. The vehicles in Classes 2, 3 and 4 traveled 93 miles per day. The minimum speed for vehicles in Class 2 was 9⅜ miles per hour, with maximum speed of 15⅝ miles. For Class 3 the maximum speed was 15⅝ miles and the minimum speed 7½ miles per hour. For Class 4 the maximum speed was 15¾ miles and minimum speed 6¼ miles per hour. In Class 5, public service machines which had to travel 120 miles each day, the maximum speed was fixed at 15¾ miles and the minimum speed at 9⅜ miles per hour. There was no practical representation in Class 1, which included vehicles ranging in carrying capacity from 110 pounds to 1,100 pounds, the only machine appearing in this class being compelled to abandon the trials on the first day.

* * *

One feature of the trials stood out very conspicuously; it was the general recognition of the utility of the solid rubber tire for commercial vehicles of all classes but the very heaviest type, which was not represented. With the exception of one machine, fitted with steel tires, rated to carry three tons and with gross weight of over five tons, all the competing vehicles were fitted with solid rubber tires This was in marked contrast to previous industrial motor vehicle trials in France, wherein a majority of machines were fitted with steel tires.

The attempt made by many of the competing firms to utilize spring road wheels was not attended with success.

The official report on the results of the trials will be presented in the next number of this paper when many matters not here referred to will undoubtedly receive attention.

ELECTRIC CAB OPERATIONS

IT is regrettable that the few examples of electric cab operation upon a large scale which the world affords do not present testimony which confirms the great economy of electric vehicles in general commercial service. Several reasons might be assigned for this, but a few will be sufficient.

Nearly all of the electric cab companies now in operation were formed at a time when the storage battery was but imperfectly developed and its care but little understood. To this handicap was added the recklessness of company promoters who loaded the concerns for which they were responsible with debts and obligations so numerous in advance of actual operations as to practically cripple the institutions from the start. Most of the enterprises were stock jobbing schemes, and if they have survived the manipulations of their creators it is due not to the foresight or wisdom of these gentlemen, but to the inherent merit of the vehicles themselves.

The largest electric cab company in the world is undoubtedly that operating in New York City. It owns four times as many vehicles as the Electric Motor Cab Company in Berlin, which takes second rank in magnitude of operations. The history of the former company is well known. Its operators began by buying horse cab businesses, believing that such purchases would quickly establish the basis for a permanent trade. The price paid for such investments was extravagantly high. The capitalization was not less extravagant. As a result the company from the beginning had a hard time in making a showing which would do credit to the administrative officers.

The London Electric Cab Company, formed seven or eight years ago, and allowed to perish through the incapacity of its officers and the stock jobbing tendencies of those in financial control, never challenged the admiration of the public in any particular.

The Electric Cab Company of Berlin seems to have been affected with the same taint which blighted the early career of the New York company. It is just now, like the latter concern, emerging from the darkest period of its history, and promises in the future to show profit instead of loss upon its operations. Its machines, by the way, will soon be fitted with solid rubber tires of American manufacture, it having been demonstrated after a prolonged trial that the American product gives a superior economy in service which overbalances its high cost. The directors of the Berlin company hope to save from 30 to 70 per cent on costs of operation by replacing worn, defective and obsolete parts of their machines. In the balance sheet of the company the cabs and batteries represent a value of over $550,000, the batteries alone being valued at $110,417.

When the company's outstanding orders are executed it will have 186 cabs, 40 private vehicles and 8 machines for the instruction of employees, a total of 235. In the first year of operations the company's income, which amounted to about $210,000, was almost exhausted by the expenses, which amounted to about $200,000. By the time allowance had been made for such items as depreciation, the net loss was about $15,000. Recently, however, higher fares, lower charges for electrical current and improved construction have encouraged the directors to believe that from this time on a profit will be shown on operations.

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Motor Wagon Operation

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

ONE point which the careful driver watches with the keenest interest is the condition of the steering gear, particularly with reference to the ease with which the wagon may be controlled. It is really surprising how much difference in the steering is produced by a very slight dryness in the knuckle bearings. Aside from the difficulty of controlling the vehicle readily and well under such circumstances, it is important that such stiffness be relieved at once, as it may be the forerunner of some more serious ailment.

Care of Ball Bearings

Generally speaking, ball bearings, once properly adjusted, will run for an indefinite length of time without causing any trouble, and without requiring any further attention than a very rare inspection and replenishment of the lubricant. However slight their normal wear may be, on the other hand, in certain cases outside conditions contributing to a loss of proper adjustment, or the presence of a great deal of dirt, may cause them to become disordered much sooner than should be the case in theory. Whenever the load is relieved from a horizontal thrust bearing of the plain type the balls tend to fall to the bottom of the race and, where the play is considerable, to get a little off their normal track. When the pressure is again brought to bear on them they must therefore be forced back into place with a certain amount of resulting wear on the edges of the race, and a liability of bruising or cracking the balls in an extreme case. On account of this remote possibility, it is well to inspect all such bearings as frequently as possible, taking care to see that there is no more play than is absolutely necessary, and that the bearings are not disaligned so that the load falls unevenly on opposite sides.

Importance of Lubrication

Few seem to realize the great importance of proper lubrication. The whole life of the rubbing parts of machinery is dependent upon proper attention to this matter. Every bearing and gear-wheel should have oil in profusion if it is to be expected to last for any length of time without causing trouble. The difference between a lubricated bearing and one without any oil is as follows: The dry bearing consists of a rotating part upon a stationary part, the two metallic surfaces being rubbed together so that there is friction, wear, and heat. The lubricated bearing, while precisely the same in construction, has a film of oil upon both the journal and the bearing, consequently the two metallic surfaces are kept apart, the friction being between the two oil films. That is the principle of lubrication. It is essential that every part should have an oil suited to it: thus, if a bearing is revolving slowly, with considerable pressure upon it, a thick oil must be used. If the pressure is great and the speed high, a thinner oil is necessary. Similarly a high speed bearing with little pressure requires a thin oil. The reason that a thin oil can be used upon a high speed bearing, even when there is pressure, is that the speed naturaly draws the oil in with a certain amount of force. Practically every driver has his own idea as to the proper amount of oil required and the way to apply it. But people who will assert that they turn on their lubricator till the smoke issues from the exhaust box and then turn it off, are quite on the wrong track. Obviously it must be wrong to flood a bearing at the beginning of the day and let it run for a period with the oil getting less and less. What is wanted is a steady supply all the time there is movement, and preferably a certain amount of pressure to force the oil into the bearing.

Remedy That Ruins Differentials

Although the stock remedy for a broken chain or sprocket on a double chain-driven vehicle is to block the differential and proceed "on one side," as the locomotive catechisms have it, it should be borne in mind that that is at best a harsh and unfeeling expedient, likely to work more harm than good. For it is to be observed that many a perfect differential has been ground to dust by that same innocent appearing process. Hence, generally speaking, it should be regarded only as a last resort. Broken chains can generally be repaired by the roadside, with a little time and patience, and even broken sprockets, which are rare enough anyhow, have been known to submit to a certain amount of patching, which has served to good purpose in the long run.

Worn Chains

One cause of unnecessary wear in chains is failure to keep the sprockets in proper alignment. In wagons fitted with side chains this condition may arise through the shifting of an axle sidewise under the springs, or the unequal length of distance rods. Care should be taken in adjusting the chains to see that these rods are taken up or let out equally, so that each pair of chain rings revolves in the same plane. To determine whether a chain is seriously worn it should be stretched out tight on a smooth floor, and then its ends should be pushed toward one another, without buckling it out of a straight line. The difference in its length when tightly stretched out and when its ends are forcibly pushed together is the sum total of the wear of the rivets. If this amounts to two inches or more in a chain of usual length, it should be replaced. It is a bad practice, however, to put a new chain on badly worn sprockets.

A motor bus operated by the Sarnia Automobile & Bus Company, of Sarnia, Ont., was recently destroyed by fire of incendiary origin. The machine was valued at $2,400; it was insured for $1,200. The company will purchase another bus.

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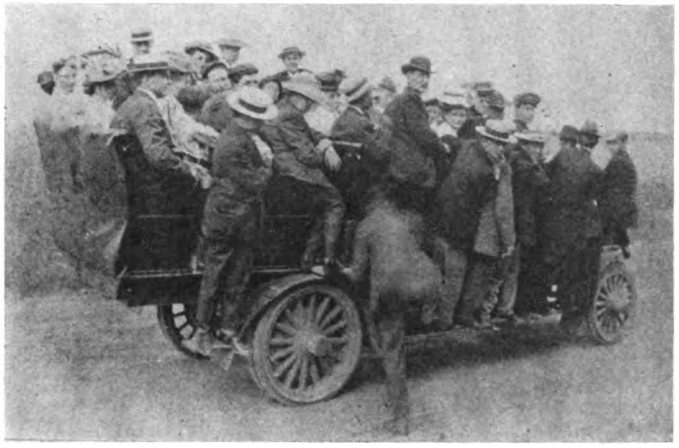
Information For Buyers

A HEAVY OVERLOAD.—Practical demonstration of the conservative rating which the Plymouth Motor Car Company, of Plymouth, Ohio, gives to its industrial motor vehicles was afforded on July 4, when one of its sight-seeing machines, operating in Plymouth, was subjected to the test which is partially mirrored in the illustration on this page. The vehicle was plying between the city and Seaton Park, a distance of 2 miles. At first it was the intention to operate the vehicle once every hour, but so many desired transportation that the machine was obliged to make the trip backwards and forwards without stopping as quickly as possible. The roads were sandy, full of ruts, heavy from recent rains, and with a steady grade one way. Although constructed only for the conveyance of twenty passengers, it was impossible to keep the people from climbing aboard the machine, and upon many occasions it carried 40 passengers, once 56 people, and upon another occasion 60. The average number carried each trip was 35. A small leak in the radiator made it difficult to keep the engine cool, but outside of this minor trouble no difficulty of any kind was experienced in the operation of the car. The machine began running at 9 in the morning, and did not cease work until midnight. This machine, carrying eighteen passengers, was recently driven from Plymouth to Sandusky by way of Norwalk and Monroeville, a distance of 40 miles each way. The run from Monroeville to Sandusky, 15 miles, was made in one hour's time. The homeward trip proved a severe test for the machine owing to the heavy rains that fell while the party was in Sandusky. The car was compelled to plow through mud axle deep a great deal of the time, and washouts did not improve matters. Owing to a change of route on the return journey many steep hills were encountered, but the car mounted them on the high gear without difficulty. The machine in both these demonstrations was fitted with the company's duplex friction transmission.



Plymouth Sight-Seeing Car, Rated to Carry 20 Passengers, Heavily Overloaded.

ONE TON BREWERY TRUCK.—In this page is shown a one-ton brewery truck made by the A. D. Meiselbach Motor Wagon Company, of Milwaukee, and sold to the Independent Malting Company, of Davenport, Ia. The design is very attractive in appearance. It will be observed that a buffer is placed in front of the radiator to give it protection. The motor develops 15 to 18 hp. It is of two-cylinder horizontal design, with 5-inch bore and 4½-inch stroke. The double mitre friction transmission with which this vehicle is equipped was described and illustrated in a recent issue of this paper. The continuation of the crankshaft carries three conical friction wheels made of tarred fibre which are brought into contact with a pair of large diameter mitre disks carried on cross shafts, from the ends of which the two side chains connect the rear wheels. Of the three friction wheels the forward one is for reverse, the two on the rear for driving ahead, the larger of the latter for starting on the slow speed, and the smaller one for driving direct. The road wheels, which are 30 inches in diameter in front and 34 inches in rear, are fitted with 3½-inch tires. The fuel tank has capacity for 10 gallons. The wheel base is 96 inches, track is 60 inches and the weight of the chassis is 2700 pounds. The speed of the machine is 12 miles per hour.

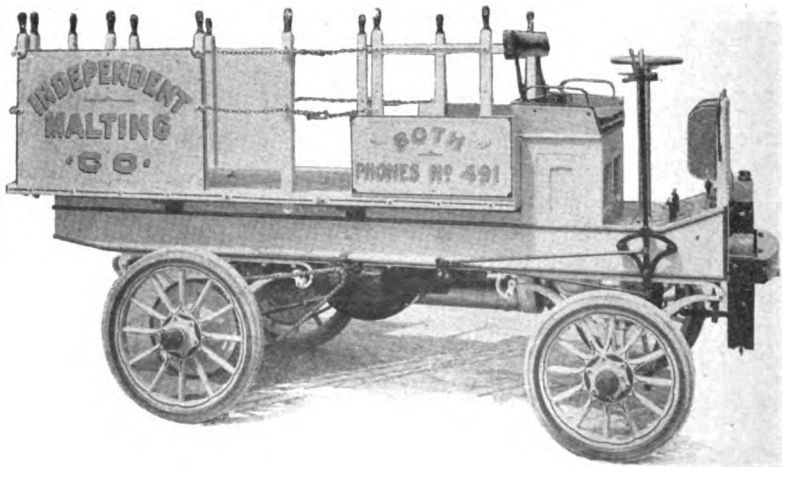
STANDARD OIL COMPANY BUYS.—A five-ton truck made by the Mack Bros. Motor Car Co., of Allentown, Pa., has been placed in the service of the Philadelphia office of the Standard Oil Company.

CASH REGISTER COMPANY BUYS GASOLINE TRUCKS.—To supplement the work of its electric vehicle equipment, the National Cash Register Company, of Dayton, Ohio, has purchased four Logan gasoline trucks.

SIGHT-SEEING CAR FOR MUSKEGON.—A 16-passenger sight-seeing car made by the Worth Automobile Company, of Evansville, Ind., has been sold to the Occidental Automobile Company, of Muskegon, Mich., for carrying passengers to the depot from the Occidental Hotel and making excursions to adjacent points of interest.

ELECTRICAL VEHICLES WITH DOUBLE POWER.—The Commercial Truck Company of New England has made a contract with the General Electric Company for the purchase of its motors and controllers to be used in the construction of electric vehicles which the former company expects to operate in express service in Boston, using current from the overhead trolley wires and running the machines by the power contained in their storage batteries when the trolley is not available. The trucks drive by all four wheels.

NO BAGGAGE TRUCKS FOR GLIDDEN TOUR.—At the eleventh hour the authorities in



Meiselbach One Ton Truck in Brewing Service.

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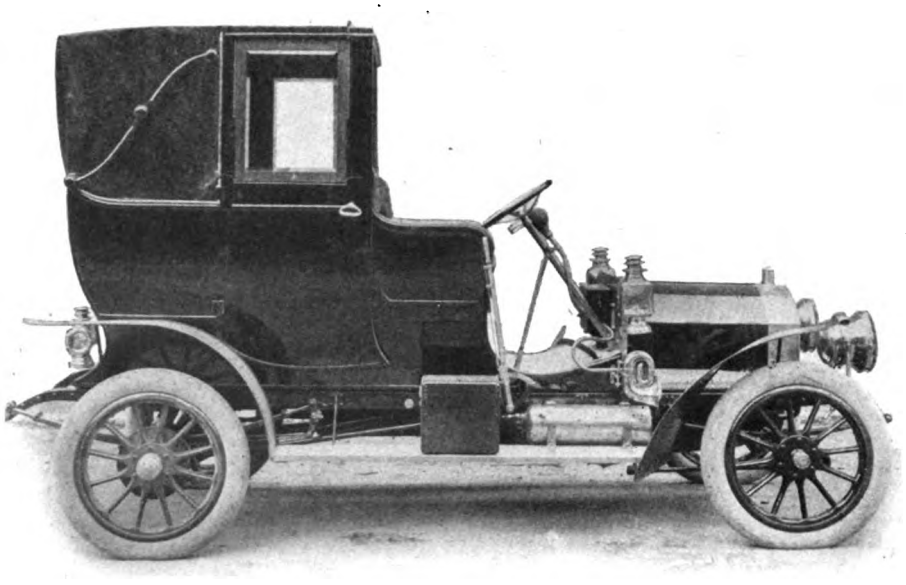
control of the Glidden tour decided that it would not be necessary to undertake to carry the baggage of the participants by motor truck, as has been the custom in former years. Some time ago a selection of the Reliance truck was made for this purpose. Upon being informed of the decision of the American Automobile Association, which had charge of the tour, the Reliance Motor Car Company replied expressing its disappointment, especially as the vehicles set aside to accompany the tourists were ready for duty, and closing with the wish that should the association decide to have official baggage carriers another year first call for the work will be reserved for Reliance trucks.

THE AMERICAN DISTRIBUTING CO.—This company, with headquarters in Cleveland, is composed of D. K. Moore, F. W. Gay, and W. P. Kennedy, and was formed to distribute the parts and materials heretofore distributed by Hayden Eames. The members of the company were formerly the trusted and active members of Mr. Eames' road and office staff, and are all well known to the trade. Mr. Eames will hereafter devote all his energies to the distribution of the automobile products of the Garford and Studebaker plants, for both of which organizations he is general sales manager.

LONG RUN FOR MOTOR FIRE VEHICLE.—A motor hose and chemical wagon which the Seagrave Company, of Columbus, Ohio, constructed in 1906, and which ever since has been undergoing tests, was on June 26 driven overland to Chillicothe, Ohio, where a convention of Ohio fire chiefs was in session, without accident or delay of any kind. After arrival the fire chiefs kept the machine going until 11 o'clock that night. The next day it was driven all around Chillicothe, at times carrying as many as 24 men. The 40 visiting fire chiefs were much impressed with the performance of the machine. The Seagrave Company, which in the past has made a specialty of building horse drawn fire vehicles, has for some time been very much alive to the necessity for constructing motor fire vehicles. In 1905 it made arrangements with the Oscar Lear Automobile Company to construct engines for fire department vehicles. As a result they now make the Frayer-Miller air-cooled engine in four and six-cylinder types, with capacity varying from 24 to 45 hp., the Seagrave Company having exclusive control of these engines for their product. The Seagrave Company is not by any means inexperienced in the construction of industrial motor vehicles, having learned much from building two and three-ton trucks for a concern which did not have production facilities of its own. The motor hose and chemical wagon which was driven from Columbus to Chillicothe was fitted with a four-cylinder air-cooled engine developing 24 hp. It was tested to the thorough satisfaction of the fire chiefs, covering 150 miles and making its way up embankments and over ground which no three horse teams in any fire department could have negotiated. The machine is capable of a speed of 25 miles per hour on good roads. The actual running time between Columbus and Chillicothe and return was 8 hours and 17 minutes, the distance covered being 105 miles, making an average of nearly 13 miles an hour. The mileage covered by the machine on this trip is equivalent to a year's service in many fire departments, and to six months' service in a city of 200,000 inhabitants. The Seagrave Company is now building for the fire department of Vancouver, B. C., two motor hose wagons and a motor chemical engine. It is significant that ths order was placed without reservation as to tests and approval.



Stoddard-Dayton Cab.

Seagrave Five Vehicle Which was Driven From Columbus to Chillicothe and Return, 105 Miles, in 8 Hours, 17 Minutes.

STODDARD-DAYTON CAB.—The 18 hp. landaulet which the Dayton Motor Car Company, of Dayton, Ohio, is building, is intended for public service. Its external appearance is similar to the public service vehicles used in many of the principal European cities. The motor is of the four-cylinder variety, cylinders cast in pairs. The transmission is of the selective sliding-gear type, three speeds forward and reverse. The rear axle is of the clutch driven floating type. The frame is made of pressed steel. The springs are semi-eliptic, 2 inches wide; front, 36 inches long; rear, 46 inches long. Lubrication is accomplished by means

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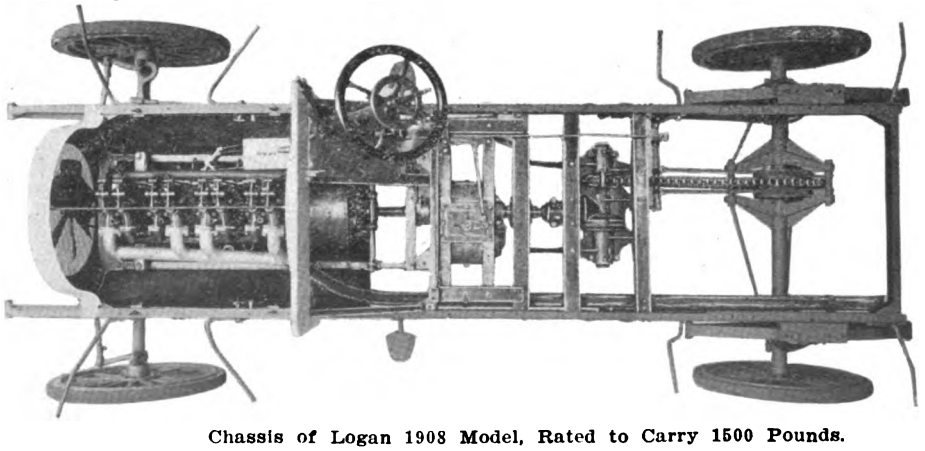
of a mechanical oiler. The drive is by shaft with bevel gears. Ignition is furnished by storage battery, concealed wiring, unit dash coil, jump spark. There is one foot brake on the transmission; emergency brakes in each rear wheel. The tires are four inches wide. The gasoline capacity is four gallons. The whole bas is 101 inches and the clearance 9 inches.

OSCAR LEAR CO. TO CHANGE BASE.—The plant of the Oscar Lear Automobile Company, of Columbus, Ohio, is to be removed to Springfield, Ohio, where more commodious quarters have been secured. It is the intention of the executive officials of the company to specialize the manufacture of motor trucks, making the manufacture of touring cars subordinate to the production of pleasure vehicles, a change of policy which the past six months has greatly encouraged. The Citizens Industrial Bureau, of Springfield, has given the company the use of a large factory building, formerly used by one of the branches of the International Havester Company, rent free for ten years and the privilege of purchase at a merely nominal sum. It also agrees to dispose of additional stock to be issued through the increase of capital from $250,000 to $500,000.

LOGAN MODEL FOR 1908.—The Logan model of which the chassis is shown on this page has been designed to fill the gap between the company's light delivery wagon, rated at 1,000 pounds, and its large truck rated at 2½ tons. It is known as Model R. It has a capacity of 1,500 pounds, a four-cylinder air cooled motor rated at 20-24 hp., and a space back of the driver's seat measuring 5 feet 2 inches by 42 inches. The frame is of pressed steel, very strongly trussed. It will be observed that the chain is placed in such a position as to give a straight pull. The radius rods are so constructed that the ends meet the centers of both driving shaft and rear axle, holding them rigid and equidistant, thus preventing all jerks in shortening and lengthening of the chain. The wagon is equipped with four brakes, two on rear axle, one on jack shaft and one on the clutch shaft. When the clutch pedal is thrown out the clutch brake is applied by the same motion, stopping the clutch from spinning and allowing the gears to be shifted without any danger to the transmission. Large flexible joints are placed between clutch and transmission, and between transmission and jack shaft, in order to render harmless to bearings torsional strains coming upon the chassis. A feature of especial interest in the construction of the chassis is that any part of it may be taken out without interfering with any other part. This permits quick repair. The control levers are situated on the inside of the car, so that the side curtains need not be raised in order to reach them. The wagon will make 25 miles per hour if necessary, and with its load can climb grades as stiff as 18¼ per cent on the high gear. The Logan company pronounces the wagon to be the best it has yet designed.



Chassis of Logan 1908 Model, Rated to Carry 1500 Pounds.

Knox Hose and Chemical Wagon in Service in Hartford, Conn.

TO MAKE STEAM TRUCKS.—The Michigan Steam Motor Company, of Pontiac, Mich., has been organized with capital stock of $250,000 to build 3 and 5-ton steam trucks. The officers of the company are: J. W. MacPherson, president; R. Jossman, secretary and R. T. Armstrong, treasurer. The company will occupy a four-story brick building with 26,000 square feet of floor space. The vehicles will be fitted with an eight cylinder compound motor of the Belknap type, developing 50 hp. The cylinders will be arranged in tandem form, each unit consisting of one pair of cylinders cast integrally and staggered at an angle of 90 degrees on the crank case. The valve mechanism will be placed between the cylinders.

BUYS TWENTY RAPID WAGONS.—C. F. Chase, the general eastern representative of the Rapid Motor Vehicle Company, has closed an order with the Chidsey Express Company, of Elizabeth, N. J., for twenty motor delivery wagons to be delivered as soon as possible.

CLEVELAND BRANCH MANAGER.—J. B. Kavanaugh, who for some time has been manager of the Cleveland branch of the Hartford Rubber Works Company, has resigned. He leaves the concern with the company's best wishes. P. H. Goodall who, for a number of years has been traveling the Ohio territory for the company, has been appointed manager of the Cleveland branch.

KNOX FIRE WAGON FOR HARTFORD.—The Hartford, Conn., Fire Department has installed in service a Knox 20 hp., two-cylinder, air-cooled combination hose wagon and chemical engine capable of a speed of about 20 miles per hour. The rear half of the floor space is utilized for the storage of 1,000 feet of fire hose, while the forward half is occupied by two 25-gallon chemical tanks which are brought into action by a bevel gear device worked by a crank protruding from the left side panel. A wire cage, located above the tanks, contains 400 feet

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of chemical hose. The wheels are 34 inches in diameter, fitted with 4 inch solid Hartford tires, Midgley treads, in the rear. For night work a Rushmore headlight, mounted on the dash and fed by a Presto-lite gas tank illuminates the roadway. The vehicle is wheel-steered and drive is from countershaft by double side chains. A ladder is carried on each side of the wagon, one a single ladder and the other a combination extension affair. The large rear step accommodates three men, while one man and the driver are seated forward. Thus far the wagon has responded to many alarms of fire and has proven very satisfactory. Hand extinguishers, crow bars, hooks, axes and other essentials are conveniently located for use.

FAITH WELL REWARDED.—The following narrative is typical of the success which will attend every well directed effort to overcome the prejudice which exists against the employment of the power wagon in service which ancient custom has led observers to believe could and should only be performed by horses. It is the story of an investor whose faith in the economy of the machine rested upon the simple and reasonable hope that it would accomplish the work for which it was designed. Incidentally it is worth while remarking that the narrator has built up a highly successful transportation business as a result of his faith in the machine whose creditable performances are here recounted. The speaker is Harry Payne, president of the Hackett Motor Car Co., operating a line of trucks between Paterson, N. J., and New York City.

"When the matter of motor trucks was brought to my attention last October I made a thorough investigation, with the result that I became convinced that the machine was a most practical affair in every particular. The general public, however, seemed somewhat skeptical, and the cry seemed to be that perhaps all that was claimed for the machine would be borne out, but, and it was a great big B-U-T with pretty nearly everybody, the chances were a thousand to one that the machine would not measure up to our expectations. I personally, however, had such unbounded faith that I decided to convince the general public that the motor truck was the coming business proposition; and, as they say, 'Faith without works is dead,' I immediately got busy and began to work, organizing a small company, known as the Auto Garage and Repair Co. We purchased one five-ton truck from the Mack Bros. Motor Car Co., putting our cold cash into the proposition, and decided to run this truck until we smashed her up, if necessary, to convince the business man that it was time for him to wake up.

"We ran this truck, carting for different business concerns, during the months of November and December and all winter long. Among the demonstrations we made was one for the Henry Muhs Packing Co. We had been trying to get these people to allow us to make a demonstration for them, but they kept putting it off until one day they sent us word that we could make a demonstration. We did it in a very satisfactory manner. Then came the great big B-U-T, and the cry was: 'Of course the truck will do the work when the roads are good and the weather fine, but what about the time when the roads are covered with snow and ice? Will she work in the storm as she works when the skies are blue?' We simply said, let us demonstrate when the conditions are just ideal for a failure. Well, one stormy day, when the roads were simply fierce and everything just as the skeptic would have it, the call came over the wire: 'Would you care to demonstrate for us today?' We went out and cranked over 'Old Reliable,' and on the second crank she started up. We took this as an indication that 'Old Reliable' was ready for the test, so just to help her along a bit we wrapped a couple of chains on the two rear wheels in order that she might get a good bite in the snow and slush, and we sent her up to the packing house. She had a very steep hill to climb before she reached the packing house, but she got there all right, and then she was loaded with six tons of dressed hog, which was one ton more than her capacity. She then started for her destination, which was Passaic, a distance of probably 4½ miles. She went over the road, bad as it was, and delivered her load safely at its destination in a little less than twenty-five minutes.

"Then people began to ask for demonstrations. They were beginning to wake up, but they gave us some pretty tough propositions, and seemed to take delight in overloading the old truck, perhaps with the thought in mind that she would go back on us, but she never even made a kick. Then the cry was: 'Well, this may be all right for the short hauls, but how about the long haul?' Again our faith measured up to the need of the hour, and we organized the Hackett Motor Car Company., which absorbed the Auto Garage and Repair Co. Our capital was $100,000, and we purchased three more trucks with specially designed bodies to carry merchandise between Paterson and New York City, a distance of some 20 miles; and right here is where we made good. We have at last convinced the people that the gasoline propelled vehicle as a commercial proposition is A 1. The business has grown to the extent that we have had to order two more trucks of five-ton capacity each, and we expect after our next meeting of the directors to order three more, which will make nine trucks running between Paterson and New York City. Those that are now running, making two trips a day, cover approximately 90 miles for each truck per day.

"In closing I would state that we ran the old five-ton truck through the heaviest snows and storms of the past winter, sometimes making a journey from Paterson to Union Hill, a distance of about 17 miles, in reasonable running time, when there was scarcely a horse-drawn truck on the streets of our city, and railroad freight was two and three days late. In the beginning we had considerable trouble in the stormy weather and snowy days with the tires skidding, and it began to look as if perhaps this would cause us serious inconvenience, but when we fitted the rear wheels with twin tires, we did away with a great deal of this trouble, and we believe that by the time the snow flies again that there will be a wheel on the market or a tire for the wheel that will do away with the skidding entirely. Our experience has taught us that our faith has not been in vain, and judging from the way the business concerns are taking the matter of motor trucks up with us indicates that the business man has awakened to the fact that there is a better, quicker and cheaper method of transportation at hand."

RECENT RELIANCE SALES IN CHICAGO.—Reliance trucks have been sold within the past month to J. T. Ryerson & Son, Chicago; Scott Transfer Co., Chicago; National Lead Co., Chicago; Sears, Roebuck Co., Chicago; Schoenhofen Brewing Co., Chicago.

RECENT RAPID SALES IN CHICAGO.—Sales of Rapid trucks have recently been made to the following Chicago concerns: Beatrice Creamery Co., C. Leopold Co., and the Chicago Piano Co.

WHITE BUSES FOR INDIA.—The Punjah (India) Motor Transport Company has just placed in service ten 30-hp. White steamers, fitted with wagonette bus bodies on the standard chassis. These buses are for general passenger service between Rawal Pindi and Murree. The route is of an especially severe character, being a constant succession of sharp grades up and down. The bullock-cart traffic—to say nothing of tongas and ekkas—on this road is enormous at this time of the year. All this means, of course,, innumerable stops and restarts on severe upgradients.

MANY RETIRE FROM ELECTRIC VEHICLE CO.—Milton J. Budlong, president, Hiram Percy Maxim, chief engineer, and George H. Strout, sales manager, have voluntarily withdraw from the service of the Electric Vehicle company, at Hartford Conn. their resignation taking effect on August 1st. It is understood that Mr. Budlong and Mr. Strout will become identified with other automobile interests as each is possessed of high administrative capacity. Mr. Maxim will open an office in Hartford and perfect some mechanical work which will be ripe for publicity in the fall.

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Morgan & Wright

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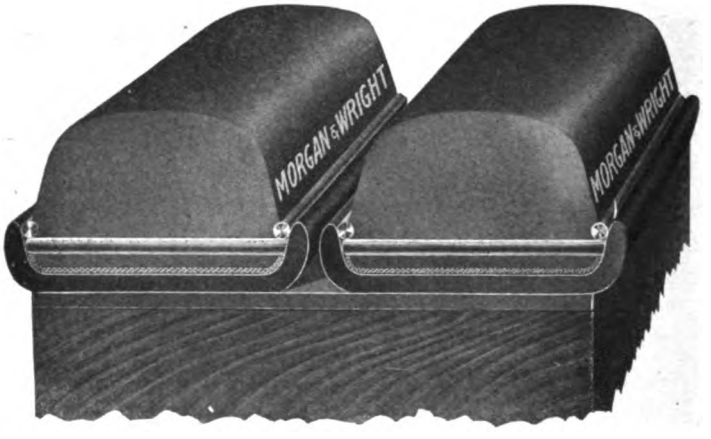
Medium, Either Single or Twin Style



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MORGAN & WRIGHT, Detroit, Michigan

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

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WALTER WARDROP, EDITOR

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Raised The Money Abroad

Motor Cab Company to Operate in New York City Sells its Securities to Foreigners

CONSIDERING that the 300 gasoline vehicles which the New York Motor Cab Company is scheduled to operate in the metropolis this fall are to be purchased abroad, one is not surprised to learn that the undertaking was financed in London and Paris. Considering, further, that European financiers regard motor cab securities as the most tempting investment of the hour, it was also to have been expected that the company's stock would be quickly subscribed. The company is capitalized at $1,300,000. Two days after the lists were opened the share capital was heavily over-subscribed.

* * *

The eagerness of foreign investors to acquire the stock of the New York company is largely accounted for by the exceptionally high earnings of motor cabs in the capitals of Europe at the present moment. The daily receipts of a London cab, for example, amount to $13. This high earning capacity will doubtless sink as machines become more plentiful on the ranks, and competition becomes more keen. Meanwhile a golden harvest is being reaped. It is not at all uncommon to find cabs on some of the well patronized ranks earning as high as $1.80 per hour for twelve hours of the day, especially when they are employed in long distance service.

Another inducement to investors was the comparative certainty of obtaining quick and large profits, the operation of light public service vehicles presenting few problems, outside of administration, which have not been solved by the operation of touring cars and runabouts. Motor cabs represent a much safer investment than motor buses. The mechanical and commercial risks which attend the maintenance of motor cabs, weighing about 2,000 pounds, are not at all comparable to the risks which accompany the operation of buses, weighing, when loaded, in the neighborhod of 7 tons.

Still another interesting reason may be assigned for floating the securities of the New York Motor Cab Company in London and Paris. The machines to be used are being made in France by the Darracq Company, an organization in which London financiers are largely interested. Under these circumstances it is but natural that Paris, as well as London, should be represented on the directorate of the company. The New York directors are: G. Winthrop Sands, a broker; W. W. Tracy, one of the partners in the banking firm of Tracy & Co., and H. N. Allen, who for a number of years has been connected with importing automobile agencies in the east. Mr. Allen is managing director of the company. Lazarre Weiller and Charles Mascart represent French capital on the board. Both of these men have been actively identified with other motor cab companies formed to operate in London and Paris, particularly such concerns as have signified a desire to fit taximeters as part of the equipment of the machines. London's financial interest is represented by Admiral Sir Charles G. Fane, who is director general of the London Motor Cab Company, another undertaking which is scheduled to make use of a large number of Darracq cabs, and the commercial success of which, so far as operations have proceeded, has been very pronounced.

* * *

It must be evident, in view of this formidable array of foreign interests and product that the New York Motor Cab Company is only by courtesy styled an American enterprise. There is nothing American about it but its name and the scene selected for its operations. It seems a pity that it should have been deemed necessary to go abroad for vehicles and capital which might have been procured in this country if proper representations had been made to native investors. Fortunately the company can have no monopoly of traffic. Its investment,

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owing to the necessity of paying duty on its imported vehicles, is 50 per cent larger than is necessary. If, therefore, it can pay 100 per cent on its capital stock, as the prospectus assures investors, why cannot a rival company, spared the $500,000 required to import cabs, make fully as good a showing, particularly when it is evident that at least 2,000 machines will shortly be required to supply New York's minor passenger transportation needs? The question is well worth pondering. London, with double New York's population, has orders out for 4,000 motor cabs. It is not unreasonable to assume that New York, with its 4,000,000 inhabitants and immense area to be served, will require half that number. It is nothing that New York is not a cab city in the sense that such a term may be applied to London. The public service motor vehicle creates its own traffic. It does not depend for existence upon such trade as may be wrested from horse vehicle enterprises. It accomplishes work which nobody ever thought of assigning to horses, its range being limited solely by the desires or necessities of passengers.

* * *

About 240,000 ordinary $5 shares of the company's capital stock were offered for subscription. Holders of these shares are entitled to a 7 per cent dividend, and a further dividend represented by half the net profits of the undertaking after payment into a reserve fund has been made and allowance made for directors' fees and some other trifling items of accounting.

* * *

The company's prospectus gives many interesting particulars of the enterprise. The vehicles, which can be used either open or closed, will have a seating capacity for four persons inside and one on the driver's box. They will be fitted with taximeters. Their cost, complete in Paris, is $1,750 apiece; after duty and ocean forwarding charges have been paid the cost of each machine will amount to $3,500. The cabs will be fitted with gasoline engines of the four cylinder type rated at 15-16 hp., which makes them more powerful than vehicles of the same type used in London and Paris. It is estimated that each machine will be called upon to cover 60 miles a day and that they will operate 330 days in the year. Daily receipts for each vehicle are rather fancifully figured at $24, of which sum $19.20 is represented as gross profit; the difference between these two sums, or $4.80, is to be paid for driver's wages and fuel.

By deducting the cost of rolling stock from the sum realized by the sale of securities, one is enabled to ascertain how much working capital the company has on hand to conduct operations. As 300 machines cost $1,050,000, and stock to the value of $1,200,000 has been sold, there must be $150,000 cash in the treasury, plus $100,000 worth of treasury stock. The sum of $150,000 in cash will not go very far in the matter of erecting garages and repair shops, and supplying them with the necessary equipment. Prudent and experienced investors would not consider the sum of $250,000 any too much for such purposes if the service to be rendered is to be adequately maintained.

It will not have escaped the attention of intelligent critics that the daily earnings of the New York Motor Cab Company's vehicles are estimated with unusual liberality. A motor cab may be capable of earning $24 a day for a short time, but it is not likely that such high receipts can be permanently maintained. There can be no assurance that the company will never be called upon to lower its rates, either by competition or municipal enactment. It is extremely doubtful if, after the novelty of the service has passed away and competitors begin to make their appearance, the earning capacity of motor cabs in New York will be more than $10 or $12 a day. The history of public motor vehicle service everywhere would seem to confirm this opinion. In this connection it is interesting to note that motor cab rates have been reduced by warrant of law in Berlin, that in Paris at least fifteen different tariffs prevail, and that in New York City itself the promoters of motor cab enterprises have already threatened to diminish the profits of the business by starting a war of rates.

* * *

As an offset to any depreciation which might result from failure to maintain a high level of vehicle earnings investors are assured that extreme liberality has been practiced in estimating working expenses. Upon examining the various items listed under the head of working expenses one gains the impression that the accountants have needlessly exaggerated the safety of the investment. For example, it is obviously impossible that the tire maintenance of a motor cab should cost $2 a day. If it was the purpose to show that gross earnings would always have a safe margin over working costs and fixed expenses, surely this could have been done without resorting to gross misrepresentation concerning one of the principal items of maintenance. Artificial accounting of this sort serves no good purpose, particularly as the cost of tire maintenance can, from experience in the service under consideration, be calculated with uncommon precision. Two sets of tires should be more than enough for a machine which is only required to travel 19,800 miles in a year, or 60 miles a day for 330 working days.

The estimated cost of repairs and upkeep, figured at $1 per day per vehicle, is also ridicuously high and calculated to give false impressions concerning the durability and economy of the commercial motor vehicle. A motor cab that cannot be maintained in perfect working order for half that sum is not worth putting into public service.

* * *

In presenting the following table of working expenses the company truthfully enough asserts that the figures are twice as high as is customarily allowed for the operation of taximeter motor cabs in London or Paris:

Repair and upkeep	$1.00	per	day	per	cab
Tires	2.00	"	"	"	"
Lubricating oil	.25	"	"	"	"
Chauffeur's clothes	.25	"	"	"	"
Insurance	.25	"	"	"	"
Garage	.20	"	"	"	"

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Washing	.20	per cab per day
General Expense	.50	" " " "
Advertising and General Expense	.60	" " " "
Unforseen Expense	.25	" " " "
Total	.$5.50	" " " "

Deducting the above estimated cost of operating each cab from the gross profit of $19.20—which as before shown represents the difference between driver's wages and fuel and estimated gross receipts of $24 per day—gives a net profit of $13.70 per cab per day. Out of this taximeter license charges and depreciation have to be taken. When this has been done the business in gross stands as follows:

Cost of 300 cabs, including duty and ocean charges	$1,050,000
Annual profit from operating 300 cabs, each earning $13.70 net per day for 330 days	1,356,000
Depreciation on 300 cabs, costing $3,500 apiece, at 25% per annum	262,500
Taximeter licenses at $1 per week per cab for 300 cabs	15,600
Net annual profit	1,077,950
Seven per cent dividend on capital stock of $1,300,000	91,000
Balance available for annual distribution	989,000

* * *

If earnings and operating costs should turn out as the promoters anticipate, the stock of the New York Motor Cab Company will stand quite a lot of dilution. It's a pretty rich investment, much too rich for the capitalization.

* * *

Another motor cab enterprise which has come to the surface in New York in the Taxi-Cab Company which, it is gossiped, is rather closely related to the New York Motor Cab Company. Whether or not this relationship is that which exists between a parent company and a subsidiary one is not known. It is significant, however, that the Taxi-Cab Company also proposes to operate Darracq machines. The company has leased a plot of ground located near the junction of 57th street and 11th avenue and has announced its intention to erect a garage planned as a five story-building, each story capable of accommodating 200 vehicles. The floors of the building will be connected by means of inclined runways.

A butcher in Reading, Pa., makes deliveries to customers by means of a motor wagon containing a refrigerator. As an advertisement, meats are displayed behind a glass panel.

Intercity motor trucking is being carried on between Neenah and Menasha, Wis.

In the reorganization of Chicago's police department motor patrol wagons will figure conspicuously.

BUSES AS FEEDERS TO RAIL SERVICE

NOT long ago the cable informed us that the motor bus service furnished Berlin by an omnibus company, which had heretofore operated horse drawn vehicles, was so unsatisfactory and the financial showing so poor that structural and administrative changes of the most radical kind would be necessary before either the machines or the service could be made acceptable to the public. This information, while purporting to disclose the status of the motor bus in the German capital, actually did nothing of the kind, for while readers were busy digesting this latest evidence of failure Berlin's street railway company was completing arrangements for the launching of a much bigger project that it was sought to disparage, its intention being to use motor buses as feeders to all its fixed lines of travel.

At this moment the Berlin street railway company has 35 motor buses in commission, each with carrying capacity for 37 passengers, and in a very short time expects to have a fleet of 60 machines in operation. The managing director of the street railway company does not consider the experience which the Berlin General Omnibus Company has acquired with motor buses as at all decisive. He points out that the administrative staff which his company has appointed to look after motor bus traffic is far superior to that which the omnibus company is able to afford. Furthermore, the street railway company is by law enabled to charge a higher rate of fare than the omnibus company. Other advantages on the side of the street railway company's undertaking are suitable facilities for effecting repairs, finely equipped shops, a higher trained staff of engineers accustomed to dealing with mechanical traffic, and a thorough knowledge of the difficulties to be overcome, the latter based upon the experience of motor bus companies in London, Berlin and other European capitals.

The sanity of the Berlin street railway company's project becomes evident when its managing director flies in the face of all precedent and calmly remarks that big profits are not to be expected from the operation of the auxiliary machines. If this is the attitude of a company having ample funds at its disposal and a virtual monopoly of traffic, one is concerned to know what fate lies ahead of those motor bus enterprises which are hurried into the world with the expectation of speedily making their backers rich. We are inclined to think that the majority of people, before passing final judgment upon the utility or commercial worth of the motor bus, will wait until such effectively organized corporations as street railways have had an opportunity to test both one and the other.

One of the advantages of the motor driven police patrol wagon is thus expressed by a reflective department chief: "When we get a hurry-up call in the night for the machine it goes into action without clatter of hoofs to give warning to burglars and other criminals whom we may be anxious to apprehend."

A fleet of motor buses is operating in Cairo, Egypt.

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Do Heavy Wagons Pay?

Some Reflections Occasioned by the Assertion that they cannot be operated Successfully.

BUSINESS life would be very gray and unimproving if it was the custom to pay more attention to those who fail than to those who succeed. Fortunately for the progress of civilization it is the hits that are counted. It is a waste of time to keep tab on the misses.

A few people in every age are temperamentally inhibited from succeeding in any undertaking which has an element of novelty in its composition. It is their habit to defend their record of incapacity by doubting the ability of anybody else to do better. They look upon personal defeat as a universal calamity. What they have failed to accomplish is obviously impossible. After them the deluge.

* * *

It would be difficult to produce a better example of the despair which is peculiar to this nil admirari cult than is contained in the following letter from a disappointed user of heavy electric trucks:

To THE EDITOR—We do not know whether, in your issue of August, you refer to the situation on motor vehicles in the West or in New York. Referring especially to large type of electric vehicles, such as five-ton type, we believe that there are less of them in New York, operating on the streets, than there were four years ago. With very few exceptions, the users of the heavy type of motor trucks are disgusted with them, and they cannot be operated in competition with horse-drawn vehicles.

We have been operating heavy trucks for a period of five years, and despite our best efforts we are forced to acknowledge a mistake in ever taking them up. We have discontinued their use and gone back to horse trucks, which we can operate for one-third less than we can motor trucks. We are afraid that the West will awaken one of these days to find themselves rather disgusted with their use of motor vehicles, as the agents have rather given up the canvassing of New York and are centering their energies on western points.

We note quite a number of small delivery wagons being made which seem to have proved a better success than the heavy type.

We have not tried gasoline power, but from reports from other sources who have we find their record as bad or worse than the electric. LANG & COMPANY.

New York City, August 6, 1907.

* * *

Note that there are a few owners of heavy electric trucks who are not disgusted with the machines. How does it happen that there are any? The vehicles are all of the same type. Are the few at fault in making their vehicles pay? It would seem so.

Our correspondent believes that there are fewer 5-ton electric trucks in New York today than there were four years ago. It is our belief that there are more. Consulting the evidence of factory records of production and sale, we should say there are twice as many. But perhaps the records have not been well kept.

Heavy electric trucks cannot be operated in competition with horse drawn vehicles, says our correspondent. Not if the machines are kept inactive half the time and misapplied and abused all the time. Where these conditions do not prevail the cost of operating heavy electric trucks is much less than that of the draft animal service they replace.

* * *

Perhaps we are not sufficiently impressed with the resistance which Lang & Company made in order to avert a disaster which was impending for five years. Their "best efforts" to maintain the service may have been inadequate. One would like to be informed concerning the exact nature of the precautions taken to keep the machines usefully employed. Batteries may have been getting too much attention from a so-called electrical expert. We have yet to hear of a case in which an electric wagon of orthodox design did not respond to genuine expert care and administration.

About the time that Lang & Company bought its machines the Chicago firm of Montgomery Ward & Company also purchased motor trucks of like capacity and manufacture. For a year or so the Chicago firm experienced the usual difficulty of the period in keeping its machines in service. Instead of employing a competent battery caretaker, they entrusted the maintenance of the vehicles to a concern which lived out of the sale and care of gasoline touring cars, and which knew very little about the treatment which should be given to a storage battery. The natural result of this farming out of work which should have been undertaken by the owners was that the machines were often out of commission and seldom as efficient as they should be. Costs of operation ran high, and altogether the service of the trucks was very unsatisfactory. Discouraged, but not dismayed, the owners determined to maintain the vehicles themselves, an intelligent battery caretaker being hired for the purpose. Immediately the service of the machines began to improve, and within a very short time thereafter the manager assured the writer that the new transportation system was decidedly economical. Eighteen months ago he made this declaration: "We have paid the price of knowing how heavy electric trucks should be operated and maintained. Our machines are now showing a balance on the right side of the ledger, and we propose to see that they continue to make money for us."

What conclusion is to be drawn from this experience? Is it that the administrative system of the Chicago concern was developed by chance and that its machines could not be made to operate profitably in New York? Has climate anything to do with the success or failure of heavy electric trucks? Why should the "best efforts" of one concern lead to the abandonment of power wagon service when the "best efforts" of another result in its perpetuation?

* * *

It is meet and proper that Lang & Company, having failed to profit by the employment of motor trucks, should

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restore the draft animal service which the machines superseded. An instrument which causes loss deserves to be discarded. The defection of Lang & Company is chronicled with regret. The success of Montgomery Ward & Company in a similar undertaking, however, must command admiration.

* * *

The closing paragraph of Lang & Company's letter shows how deep is the despair in which the concern is plunged. Not having used gasoline wagons it finds that they are as bad or worse than electrics. A Scotch jury's verdict. Guilty, but not proven. Prejudice is responsible for many queer freaks of the human mind

It is commonly observed that as the load capacity of motor wagons rises the difficulty encountered in making them pay increases. This is invariably due to the fact that heavy trucks are seldom fully loaded or actively employed. The losses resulting from the misapplication of very heavy wagons are much more serious than the losses which arise from the misapplication of light wagons. The cost of maintaining a 5-ton wagon, pulling two or three ton loads, is necessarily proportionately greater than the cost of maintaining a one ton wagon pulling a half ton load. Rather than admit their own lack of judgment in selecting machines which are not well adapted to service, a good many of the early purchasers of 5-ton electric vehicles have fallen into the habit of condemning them as unsuitable for any class of work. Yet experts who have impartially investigated the causes of heavy power wagon failures, invariably report that bad administrative and operative methods, rather than defective engineering design, have been to blame.

STABILITY OF MOTOR BUSES

THE overturning of a London motor bus, as the result of skidding and collision with the curb, has again caused nervous and excitable people to question the stability of this double decked vehicle when in motion. It appears that the machine in question skidded clear across a slippery roadway, turned completely around and, after crashing violently against the curb, upset.

From the noise which the sensational press and prejudiced critics have been making over the incident, an unenlightened person would be justified in concluding that motor buses were to be regarded as constantly menacing the lives of passengers and pedestrians. It must be evident that if the double decked bus is top heavy accidents of the kind under consideration would be very numerous, especially in a city where upwards of 900 of these vehicles are in operation fifteen hours of every day. Happily, however, the only other scrap of evidence which might indicate that the machine is top heavy is furnished by the records of the Handcross disaster, which occurred a year and a half ago, when a vehicle in descending a declivity became unmanageable, dashed down hill, slewed into the roadway and overturned upon having its momentum thus suddenly checked. At the official inquiry following this disaster it was clearly demonstrated that under normal conditions of service the double decked machine was not top heavy. This opinion was later confirmed by experimentally tipping one of the machines to an angle 45 degrees and 58 minutes from the vertical, and proving that it was able to right itself as soon as the elevating jacks were removed.

As a matter of fact, when the motor bus is loaded inside, the angle to which it may be tilted is so great that there are hardly any conditions of public service which can cause it to be overturned, so low is the center of gravity. Even under the worst conditions which might be imagined, namely, a full complement of passengers on the top deck and no passengers inside, it is practically impossible to overturn a motor bus when in normal motion. If, however, a double decked machine, so loaded, was traveling at a high rate of speed, and should skid and turn around, it must be obvious that it would be liable to overturn. But then it should be remembered that a vehicle of almost any kind would turn turtle if its progress was similarly interrupted. The tendency to skid and overturn is much accentuated by excessive road camber.

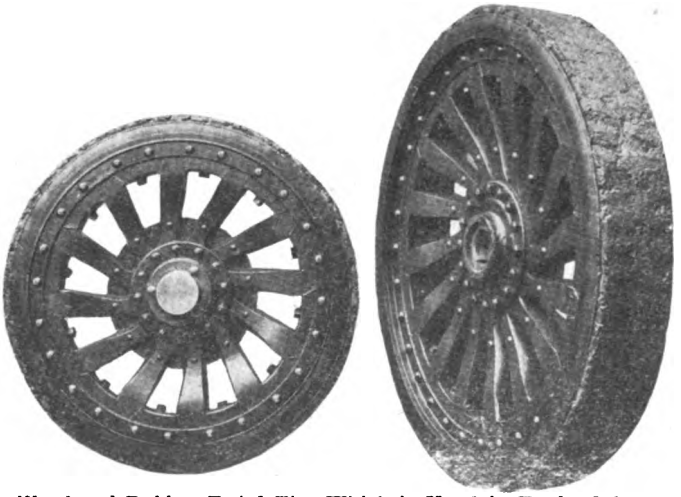
All things considered it would seem that the overturning of a motor bus is not properly an occasion for condemnation of its engineering design. It is much more to the point to inquire why the streets and roadways, which are constructed expressly for vehicle traffic, are not made safe for their operation.

PHILADELPHIA BUS SERVICE

ELECTRIC buses operating in Philadelphia are now running under three minute headway. Service is commenced each day at 5:30 in the morning, the last trip being made at midnight from the heart of the city. The madhines are operated over asphalted streets. The fare is five cents.

The Taximeter Cab Company, of America, has been organized with capital stock of $1,250,000 to operate motor cabs in the principal cities in the country. The directors are J. W. Oakford, C. A. Sparks and D. R. Falkner, all of New York.

In some foreign bus service trailers are used in conjunction with small single deck vehicles.



Wood and Rubber Tread Tire Which is Used in England for Very Heavy Wagons and Tractors

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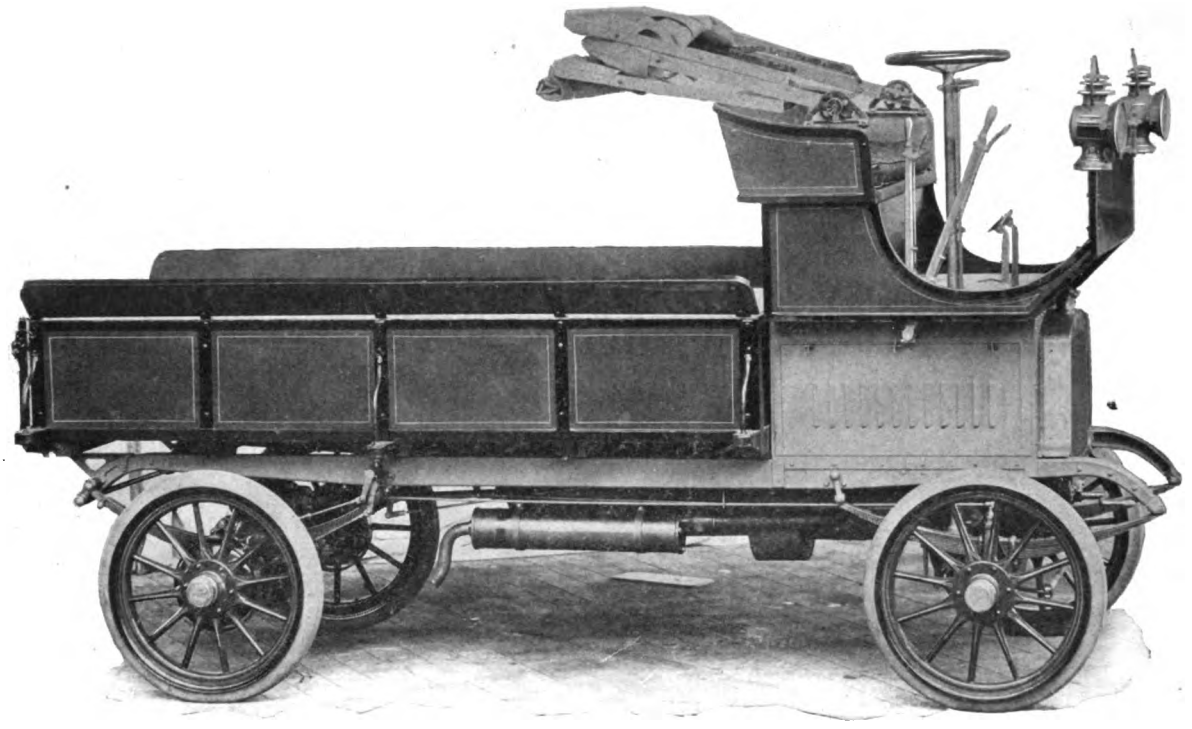

Mitchell One-Ton Truck Which Will Carry a 50 Per Cent Overload From Racine to New York City

Long Overland Trip

One Ton Wagon with Heavy Overload to be Driven from Wisconsin to the Seaboard

IN undertaking to drive its one-ton gasoline truck from Racine to New York the Mitchell Motor Car Company shows praiseworthy appreciation of the public's interest in the subject of long distance road freighting.

While the history of motor wagon transportation teems with interesting examples of the economy of the machine in short haul city work, it is practically barren of statistics and information pertaining to lengthy operations over country roads. The service conditions encountered in city and country are so radically different that little of the knowledge which has been gained by observing the behaviour of machines in large industrial centers is available to those who are curious to know how much reliance can be placed in them when they are cut off from stable and repair conveniences and forced to travel over highways which are occasionally good, more frequently bad, but generally of an indifferent character. The trip in question will do much to supply this deficiency. At the least, it will afford reliable information concerning the cost of operating one-ton gasoline wagons in a service about which little of practical importance is now known. There cannot be too much confirmatory evidence of the usefulness, reliability and economy of motor wagons, from the highest to the lowest rating, in all classes and under all conditions of service.

* * *

Unless some unexpected hitch occurs the Mitchell company will start its truck from Racine early in September. The advantage which the selection of the fall season would seem to give the machine—weather then usually being well settled and roads in fine condition—is to a large extent offset by the fact that it will be required to carry a 50 per cent overload all the way, which extra burden may not be lightened in the event that the weather proves treacherous. In view of the general abuse to which the rating of motor wagons is subjected, it is interesting to find that the Mitchell machine is to be tested with such a high overload as has been indicated. So long as the average buyer persists in disregarding the load limitations which rating is supposed to fix, it is perilous not to have a large factor of safety to take care of overload.

* * *

The route to be followed by the Mitchell wagon has not yet been determined. The company is undecided whether to send the machine over the southern route, through Indianapolis, Columbus, Pittsburg and on east through Philadelphia, or over the northern route, through South Bend, Cleveland, Buffalo, Syracuse, Albany and then down the Hudson. Whichever route is chosen it is certain that the truck will not reach its destination without having had some exceptionally trying experiences, for, though the roads at this season of the year are in tolerably good condition, there are many formidable obstacles in the shape of grades and unimproved highways to be overcome. Generally speaking, there are no road conditions of city service which so severely tax a motor vehicle as are to be found in the country, with its ruts, stony patches and sandy stretches to test the reserve of power, the durability of tires and the general soundness of engineering design. The bulk of city service may be regarded, in contrast with the bulk of rural service, as a fairweather demonstration of the machine's capacity and economy.

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It is calculated that the journey, whichever route is taken, will require about two weeks for its performance. It is not to be inferred from this that the machine is incapable of accomplishing the trip in quicker time. Speed above the normal is not to be a feature of the demonstration. Traveling 10 miles an hour and operating for 8 hours a day, 80 miles a day should be covered. It is unlikely, however, that the operator will be instructed to make more than 70 miles a day, which would be fully three times as great a distance as a horse drawn truck of equivalent capacity could be expected to cover. The trip is not intended to establish a record for speed. Its main purpose is to show that so much merchandise can be hauled so many miles, with reasonable expedition, at a cost which is to be educed from the performance.

The load will be one and a half tons of Cascarets, valued at $6,000, in addition to which there will be a large amount of advertising matter and the baggage of the operator and an attendant.

* * *

The notable mechanical feature of the truck is the spiral gear drive, a device which the company's engineers assert is singularly efficient when the machine is climbing hills under load. The spiral gear drive, so far as we are aware, is only employed in this country in Mitchell trucks. It is not a new mechanical principle, however, having long been employed and very successfully demonstrated in heavy motor bus service abroad. In no sense is the truck to be considered as embodying any of the features which are peculiar to the company's touring car design. It is constructed throughout of special material, and with the exception of the engine and lubricator is virtually a new model designed expressly for commercial service. The gear ratio is six to one on the high, which enables the machine to make a speed of 15 miles an hour. Obviously this speed is a little too high for regular commercial service, but no doubt there will be many occasions when it will be found particularly useful to have the implied reserve speed. It is the intention that the truck shall travel at an average speed of 10 miles per hour, exclusive of stops in towns and villages.

The wheel base of the truck is 110 inches; its tread is 56 inches. The front wheels will be equipped with 30 x 3 inch solid tires, and the rear wheels with 30 x 3½ inch tires. The body width, inside measurement, is 43 inches; the body length, inside measurement, is 96 inches. The depth of the body is 14 inches. The transmission is of the sliding gear variety, with three speeds forward and a reverse. The front axle is of I-beam construction. The weight of the truck complete, without load, is 2,200 pounds

* * *

In the next issue of this paper we hope to be able to present a detailed statement showing costs of operation on the journey, and supplement these interesting figures with a narrative of the behaviour of the machine while en route.

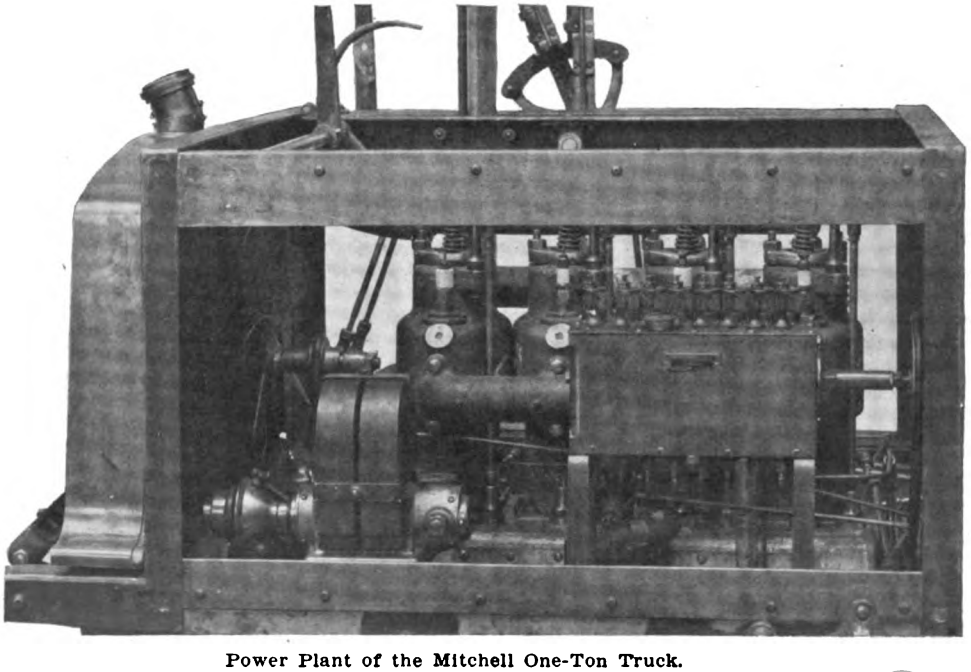
ANOTHER FIRM TO BUILD TRUCKS

THE Curtis Motor Truck Company has been formed in Decatur, Ill., to build various kinds of commercial motor vehicles. The capital stock of the company is $250,000, of which J. P. Drennan, O. A. Bloen, C. C. Leforgee and J. D. Johnson hold $5,000 each, F. A. Curtis holds $80,000 and Mary A. Curtis $150,000.

The company has purchased a five-acre tract for the erection of a factory which it is expected will be erected and equipped within ninety days.

The fire department authorities in Montreal, Canada, have decided to purchase two motor chemical wagons for use in outlying districts.

The mining town of Webb City, Mo., has raised a public subscription to purchase a motor chemical wagon, and it is probable that a motor fire engine will be added later.



Power Plant of the Mitchell One-Ton Truck.

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Frenzied Finance

Enterprises Capitalized at Many Millions Launched by Promoter Charles Berg

JUST now Charles Berg and his various commercial motor vehicle enterprises are very much in the public eye. Berg has his counterpart in Pennington, whose career as a frenzied financier is too well known to need review. Like his sensation-loving mate, Berg poses as an engineer of high repute. Both men are bold in action, audacious in statement, and temperamentally prevented from calculating in sums of much less than a million.

The basis of all Berg's operations is ownership of a patented electric drive, consisting broadly of a motor in each wheel. We are not concerned with the mechanical value of the device. The operation of vehicles in which it is employed takes care of that. If it shall develop that the four-wheel drive is economical under general or selected conditions of service it will survive; if not it will perish. Meanwhile it is on trial, and judgment is naturally suspended.

* * *

Berg has from the beginning had his eye on the passenger transportation business of all our large cities. Wherever he has seen an opportunity for developing motor bus service there he has formed one of his "transit" companies. A partial list of the companies he has organized follows:

Imperial Electric Motor Company, organized under the laws of Maine, to control and manufacture four-motor electrical equipment for commercial automobiles; capitalized at $1,000,000. Licenses granted to subsidiary companies, but no equipment manufactured.

Cleveland Auto Transit Company, capitalized at $600,000. Organized two years ago to operate 38 sightseeing cars equipped with Imperial four-motor apparatus. One car delivered.

Imperial Transit Company of Pennsylvania, organized at Pittsburg and capitalized at $1,000,000.

Imperial Transit Company of St. Louis, capitalized at $600,000, to operate 30 Imperial cars. No cars delivered.

Citizens' Transit Company of Detroit, capitalized at $300,000 and subsequently increased to $500,000, to operate 15 Imperial cars. Three cars delivered, all failures.

Imperial Auto Company, of Detroit, capitalized at $300,000 and subsequently reorganized under the name of the Commercial Motor Vehicle Company to manufacture Imperial cars. Turned out three, all failures.

Imperial Electric Motor Company, reorganized under the laws of New Jersey, capitalized at $1,000,000.

Auto Transit Company, of Philadelphia, capitalized at $1,000,000 to operate 30 Imperial coaches. Twenty machines are operating.

Commercial Truck Company of America, organized at Philadelphia; capitalized at $1,200,000 to manufacture Imperial coaches and commercial motor vehicles.

The impression must not be gained that Berg is content to stop at introducing the motor bus into Philadelphia, Cleveland, Detroit and Pittsburg. Fourteen other cities are to be similarly benefited. But it is hardly worth while considering what he proposes to do elsewhere until we take a glance at what he has actually accomplished in some of the places named. And this we are fortunately enabled to do by reprinting an article which recently made its appearance in the columns of the Detroit News. This article, which gives a graphic illustration of Berg's methods of promotion and his practices in bringing convincement to investors, follows:

A few days ago there appeared in the daily press of Detroit a short statement pertaining to a suit in one of the justice courts, which litigation had for its object the possession of a large sightseeing automobile operated by the Citizens' Transit Co. A day or so later a truck backed up to No. 7 Fort street west and removed a desk and chair, the office furniture of the Citizens' Co., and thus the local corporate existence of that concern, to all outward appearances, came to an end.

Back of these two seemingly unimportant occurrences in the commercial life of the city there is a story of frenzied finance worthy the efforts of a Tom Lawson in the telling. The story has to do with one Charles Berg, in whose operations Detroit has figured as a mere unit, but into which some of the most influential men of the city have been drawn, and in connection with which a suppressed suit was started and charges of fraud made against prominent capitalists and financiers. St. Louis, Cleveland, Toronto and Phalidelphia also subscribed their thousands to Charles Berg's schemes, also saw failures, but never at the expense of Promoter Berg. Fourteen other American cities were on this promoter's list for operations similar to those in these cities.

Berg's Advent in Detroit

Looking back to the winter of 1902-03 we find one A. B. McCord, of Chicago, in the city, endeavoring to interest local capitalists in an automobile manufacturing concern. He carried his promotion to a point where success seemed certain, when Berg came to the city to further the McCord project. From that point the interest centers around Berg. The Imperial Automobile Co. was organized with the following local men on the board of directors: Dr. J. B. Book, president; M. L. Williams, treasurer; Hoyt Post, D. W. Simons and Alexander Black, of Toledo. McCord was also on the board. The company was organized to manufacture automobiles for commercial purposes, such as trucks and carriers of heavy freight. These autos were to be equipped with the Imperial electric motor, an electrical device, the patent for which was held by the Imperial Electric Motor Co., a Berg corporation capitalized originally at $1,000,000. This corporation controlled the patent, also a Berg proposition, on a four-drive-four-motor system of propelling automobiles—that is, an electrical equipment which transmitted power to all four wheels of the vehicle. The local Imperial Auto Co. was incorporated with a capital stock of $300,000, and Mr. Berg was given $140,000 of this stock for the exclusive right to the patent in Michigan.

Exchanged Stock for Commodities

Berg no sooner secured his stock than he began to get rid of it in this fashion: A piano dealer got nearly $600 worth for a piano. A tailor got about $2,000 worth. Other stock he sold at such cut rate prices that when the directors endeavored to interest their friends in the company to the extent of selling them treasury stock, they found that the cut rates were standing in the

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way. The par value was $10, but Berg had distributed stock out of his holdings at so much less that the treasury stock became a dead issue.

About six months later, nothing tangible having been accomplished, it was found advisable to reorganize under the name of Commercial Motor Vehicle Co. This company organized to carry out the original plan of the Imperial Auto Co. The officers of the Commercial Motor Vehicle Co. were: President, J. B. Book; vice-president, D. W. Simons; treasurer, F. A. Smith; secretary and general manager, F. S. Evans; consulting engineer, Rudolphus Fuller; directors (in addition to the officers), Hoyt Post, George H. Barbour, Jr., A. M. Kerr, Charles Berg, and Kenneth L. McLaren, of the New Jersey Trust Co., N. J. Subsequently Theodore H. Eaton was interested in the project, and having accepted a large block of stock at par value for a piece of property on Franklin street, on which the company installed its factory, he was made president of the automobile manufacturing concern.

This organization then proceeded to build its first commercial truck. It purchased the parts from various institutions throughout the country, using the four-motor system, Berg's patent. The big truck was turned out for the Michigan Stove Works. It was completed in 1905, operated unsatisfactorily for about a year and dismantled. On Aug. 31, 1906, the stove company wrote a letter to the Citizens' Transit Co., asking if it wanted to buy any of the parts of the truck.

Receiver is Named

Two other cars were made under the same four-motor system and were found to be failures. One was for the Edison Illuminating Co., and the other was abandoned before it left the shop. In the face of these failures, the company was placed in the hands of Attorney Frank N. Crosby as receiver, and its affairs were closed up. Theodore H. Eaton had invested heavily, buying up considerable of the stock Berg had sold at cut rates, in addition to what he had taken at par value. The factory building was sold to the Michigan State Telephone Co.

In the meanwhile Berg hadn't been letting the grass grow under him, and in 1903 he organized the Citizens' Transit Co., the object of which was to operate sight-seeing cars manufactured by the Imperial Auto Co., subsequently reorganized under the name of Commercial Motor Vehicle Co. The prospectus of this concern, which will be dealt with more in detail later, stated that the company was to operate cars in opposition to the street railway. The officers were: Dr. J. B. Book, president; David W. Simons, vice-president; M. L. Williams, treasurer; Abijah J. Reed, secretary; Charles Berg, general manager; Hoyt Post, general counsel; A. B. McCord, superintendent; Joseph Ledwinka, construction engineer; directors, Book, Williams, Simons, Post, Black, Berg, Reed, McCord and McLaren.

The Citizens' Co. was organized with a capital stock of $300,000, and of this Berg got $140,000 worth of stock for promotion and use of the four-motor patents. The capitalization was subsequently increased to $500,000. At the time of the organization, six members put in $1,000 each—J. B. Book, Hoyt Post, A. B. McCord, M. L. Williams, D. W. Simons and Alexander Black. Berg agreed to deliver a car for sight-seeing purposes for $4,500 in June of the same year. Of the remaining $1,500, $500 went to Mr. Post for attorney's fees and $1,000 to maintain an office.

Asks Directors for $4,360 More

In January, 1904, seven months after the date on which the car was to have been delivered by Berg, he notified the company that the parts were ready for shipment, but that he hadn't the money to pay for them. He put it up to the directors as to whether they were willing to take $4,360 out of the treasury, through sale of stock, to pay for the parts. He offered to put up 50 shares of his own stock as collateral. In the meanwhile, the company had been selling stock, managing to get rid of about $30,000 worth, by selling it at $50 a share, which was half of its par value. The sum of $4,600 was therefore taken from the treasury and the parts paid for, making the car cost in all $8,860. The understanding was this: if the car proved a success, it was to be left to the subscribers of stock to say whether more cars should be bought. If a failure, the money was to be returned to the stockholders.

The car was placed on the street. It was a double-decker and made a magnificent appearance. A trial trip amid much eclat and with city officials as guests of honor was made and immediately thereafter the machine was placed in a garage. It was shifted about from place to place and finally burned up in a barn fire. It was as complete a failure in the way of a four-motor vehicle as the Michigan Stove Co. truck and the others manufactured under the same Berg system.

Failure was due to the fact that the equipment made the car too heavy. The cost of operation was enormous. Then, too, passengers sitting on the upper deck had to play "low bridge" to escape bumping against trolley wires.

Other Cities Hear of Berg

In the meantime Berg was operating similarly in other cities. But more of that later. The Detroiters, still hoping for success with the patent for which Berg had received such a handsome price, they arranged with that promoter for another car. This cost them over $8,000 also, which was more than Berg had promised, but it was as big a failure as the other.

At this point nearly all of that $30,000 was used up and still the people who had put up the money had no car. In the meanwhile Berg had traded a nice bunch of his stock for a year's board at the Cadillac, where he was living high. J. S. Jennings and John Ingdhall, tailors, also obtained souvenirs for clothes, in the form of certificates in the company that turned out nothing but failures. This stock was a part of the $140,000 worth of Citizens' Transit Co. stock that was turned over to the promoter. Berg also gave Mrs. Jessie Kieth Withall some of it for the use of her summer home on Grosse Isle by himself and family.

In the summer of 1905-6 the Citizens' company sent to New York, where a Ranier car was purchased from the Vehicle Equipment Co., of Long Island. This was one of the regular two-motor sight-seeing cars and it was put in operation in Detroit, to kill time for the stockholders while Berg secured another one of his patent equipment cars. The Ranier car made an excellent record and was sold in the fall of 1906 to make way for the car which Berg was to deliver in 1907. He declared that he now had his equipment perfected to the point where another failure would be impossible. More stock was sold, and with the proceeds, $5,000, this new car was brought to the city.

Car Weighs Over Ten Tons

It was a beautiful black Imperial car. It went into commission June 16 last. It went out of commission July 14, when the suit in the justice court brought the operations of the Citizens' company to a close. This car, in which the equipment was "perfected," weighed over 10 tons. It was a menace to life and limb, as the motorman was powerless to handle it. Once it got under headway, because of the manner in which it would skid on all four wheels, it actually left its imprint on the roadways in various parts of the city. Tires burned up frequently, by reason of the friction caused by the heavy weight. It simply couldn't be operated at a profit. It was found that it cost two and a half times as much to operate as the ordinary two-motor car.

A Suppressed Suit

In the meanwhile, the officers of the Citizens' company were facing new difficulties. Jacob Beller was one of the Detroiters who was induced to buy stock of the Transit company, having contributed $10,000 to the treasury on June 1, 1903. For this money he received certificates for 200 shares of stock.

When Beller saw the utter failure of the cars that were turnd out under the Berg patents, he demanded his money back, but it was refused. He therefore commenced a suppressed suit Feb. 19, 1906, to recover the $10,000 with interest, making M. L. Williams, Dr. J. B. Book and D. W. Simons defendants. Mr.

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Beller charged that it was represented to him that Williams had also invested $10,000; that the patent electrical equipment had been tested and found commercially and mechanically successful; that large dividends would be earned; that the sight-seeing wagons would run to Beller's garden and that he would receive additional revenue from that source.

All this, Beller says in his declaration, was untrue. The electrical equipment, he said, was still in an experimental stage; that Mr. Williams had not invested $10,000; that he had not properly investigated the merits of the equipment and that the cars did not run to Beller's garden. The defendants filed no answer to Mr. Beller's charges and on March 28, last, the suit was discontinued, Mr. Williams and Mr. Book paying Mr. Beller a satisfactory amount of money. It is said that the consideration was $6,500.

Samples of Propectus Statements

Wherever Berg organized a manufacturing or sight-seeing company, he had an elaborate prospectus prepared, to use in securing stock subscriptions. In the prospectus of the Citizens' Transit Co., Berg figured the income after this fashion: Each car will make 19 round trips or 38 single trips each day. Each car will run 19 hours each day, carrying 15 passengers on each of the 38 trips, and charging a five-cent fare. At that rate, 15 Imperials will earn $156,037.50 a year. That would be a profit of 50 per cent on the investment.

"What would stock be worth if 600 Imperials were in operation, which is a moderate estimate of the number required to meet the demands in Detroit alone for this service?" the prospectus asks.

It is to be wondered at that such literature should deceive anyone. In the first place, no sight-seeing car could make 38 trips a day and keep in running order 19 hours a day, 365 days in the year. Such a proposition is absurd. How about the many days and weeks in the year when weather would not permit a heavy sight-seeing car to run at all? And how many hours a day are there, every once in a while, when a car must be laid up for repairs? Yet this prospectus was sent out as the bona fide representation of the officers and directors of the Citizens' Transit Co. In other cities, as well as Detroit, where Berg operated he got out prospectuses containing computations exactly like that quoted.

Instances of Misrepresentation

One of the local officers makes a serious charge against Berg. He says that Berg took the record made by the Rainer car in Detroit and went to Philadelphia and organized companies there, on the strength of that record, representing it as the business done by one of his Imperials.

Another instance of how Berg endeavored to mislead the Philadelphians was when he wrote a letter in praise of himself, and asked A. J. Reed, of Detroit, who was secretary of the Citizens' Transit Company, to sign it and send it as his own to Gen. Thayer, of Philadelphia. This Reed refused to do.

Berg's Philadelphia Experience

His Philadelphia sight-seeing concern was named the Auto Transit Co., of Philadelphia. The charter was granted April 27, 1906, authorizing the company to operate a line of electric buses, beginning with 30 vehicles on Broad and Diamond streets. Twenty licenses were actually paid for at the rate of $200 each. The capital stock was $1,000,000.

Four hundred thousand dollars of the common stock was withdrawn "under original subscriptions and contracts for the equipment of the Imperial Electric Motor patents," says the prospectus, and again Berg's profits are in evidence.

Thirty coaches are but a beginning, the prospectus reads, and on five-cent fares they would earn $410,400 a year, paying 7 per cent dividend on the preferred and 31 per cent on the common stock. More of the Berg financing is evidenced by the manner in which the license to use these patents in Philadelphia was obtained.

Berg had started a similar company in Pittsburg, but somehow he was not as successful there as elsewhere. To start the business in Philadelphia the company had to get its license from the Imperial Transit Co., of Pittsburg, to use the Berg-Ledwinka patents. Gen. Russell Thayer, of Philadelphia, one of the Quaker City leading capitalists, who had been drawn into the auto business by Berg and his associates, secured the options on the Pittsburg license, together with one Imperial car Berg had failed to make good with in Pittsburg.

His Pittsburg Deal

One of the articles of agreement exhibited to The News discloses this: "The Imperial Transit Co. of Pittsburg is willing to transfer the option to the Auto Transit Co. for $96,000 and $10,000 of the bonds when issued. This payment is in trust to H. S. Kerbaugh (incorporated). The balance of the stock remaining to be issued is $900,000, par value, which is to go to the Imperial Transit Co. of Pittsburg in payment for the license in which Thayer has the option. They are to retain $250,000, and of the balance of $650,000, $225,000 par value is to go to Kerbaugh and $225,000 to Berg. The balance of $200,000 is to be placed in the hands of trustees for furthering the interests of the Auto Transit Co."

Berg also organized a manufacturing company in Philadelphia to turn out the Imperial motor vehicle. It is that the factory that sent the big Imperial Commercial Truck Co. of America, and received its charter March 17, 1906. The capital stock was $1,200,000, and $600,000 was paid for a plant at Bellwood, near Altoona. Of this $600,000, $400,000 represented patent rights and $200,000 was paid in cash. Additional shops were subsequently secured in Philadelphia. The officers were: President, H. S. Kerbaugh; vice-president and general manager, Charles Berg; secretary and treasurer, Frank Brown; directors, in addition to the officers, Russell Thayer, James O. G. Duffy.

Cleveland and St. Louis Co's. Capitalized $1,200,000

In Cleveland the Cleveland Auto Transit Co. was organized with a capital stock of $600,000, and the prospectus related in glowing terms how, under a five-cent fare system, 30 cars could earn $324,000 annually.

The Imperial Transit Company of St. Louis, organized with a capital stock of $600,000, is another Berg project. His prospectus in this instance related that 30 Imperials, during the seven months of the World's fair, would earn $1,890,000 on a 25-cent fare basis. The remaining five months, the prospectus said, would swell the amount to $2,000,000.

The capitalists Berg succeeded in getting into his St. Louis company were: H. G. Hawley, W. G. Kline, Julius Weil, J. W. Baker, John D. Johnson, Ernst Kastor. Dr. Brook and M. I. Williams, of Detroit, were also directors of the St. Louis company.

And what was the sum total of all these operations which reach into the millions, on paper, and in which thousands were actually invested? It is easily seen what Detroit got. St. Louis, however, didn't even get one car for its money. Cleveland got one, but it was as big a failure as those delivered to Detroit. It was subsequently sold to Pittsburg people for $7,500, but they were disgusted with it there, and, as has already been stated, sent on to Philadelphia. George A. Burke, of Cleveland, with offices in the Citizens' building, was instrumental in disposing of the car to the Pittsburgers. Mr. Burke is identified with the Standard Oil Co.

Interest London Capitalist

In connection with the Ranier car that was used as a substitute in Detroit, Berg also made representations abroad. Dr. Edward E. Lehwess, of 17 Cockspur street, S. W. London, Eng., came over here to see about buying some sight-seeing cars. Berg showed him the record of the Ranier car in Detroit, represented it as the Imperial four-motor car, and entered into a deal with him for the sale of a number of Imperials.

Toronto also saw Berg operations. That city got two cars for its money, but they, too, were failures. The Ranier car also served to furnish a record for the Toronto promotions.

It should not be understood that these blocks of stock that Berg got and disposed of in all these cities was the gross

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result of his four-motor idea. There must be a parent company for all these operations, so Berg organized that under the name of the Imperial Electric Motor Co. It was first organized under the laws of Maine, with a capital stock of $1,000,000. An announcement was issued later, stating that it was proposed to reorganize under the laws of New Jersey, after which the treasury would have $1,000,000 of its own stock, $700,000 worth of stock of licensed companies and $100,000 in cash.

Parent Company's Plan

The plan of this parent company was to grant licenses to subsidiary companies, like those organized in the cities already mentioned, upon royalty and percentage basis. These subsidiary companies would be obliged to buy their equipment from the Imperial Electric Co., if it ever manufactured any, and in addition to paying a royalty of $5 a motor, would be obliged to pay a sum equal to the actual cost and labor, plus an additional percentage charge. In the event the Imperial Co. was not in position to furnish this equipment, which it never has been, the subsidiary ompanies could obtain their motors elsewhere, but must pay the royalty of $5 each just the same.

In addition to the cities mentioned as having been operated in, the Imperial Electric Co. proposed to operate in the following cities: New York, Chicago, Boston, Baltimore, Washington, Minneapolis and St. Paul, Buffalo, Indianapolis, Louisville, New Orleans, Omaha, Council Bluffs, Providence, San Francisco and Los Angeles.

Thus did Berg keep up his endless chain of operations, always coming out on top—personally. Yet despite the fact that these operations were of a national character in their scope, there were apparently few who could summon courage enough to doubt his representations.

Berg's Opinion of Hinself

Berg's opinion of himself is interesting. It is expressed in that letter which he wanted Reed to send as his own to Gen. Thayer, of Philadelphia, referred to heretofore. This is what Berg says of himself, under Philadelphia date line, May 8, 1906:

"I am in receipt of your favor of the third inst, as to inquiry regarding Mr. Berg. I have personally been in two of his enterprises, in one of which I have disposed of my interest at a good profit, and am still interested in the other, thoroughly believing in the Imperial equipment and its future progress.

"I am most delighted to state that I have known Mr. Berg for over four years past and have always found him to be a gentleman of unquestionable character, of high sterling qualities and great business ability, and have heard his name mentioned by others in the highest terms.

"I have found him to be a mechanical genius, of great finanial and executive talent much above that of the average man.

"With my experience with large corporation offices, in which I have been connected, I have yet to find a man who could surpass Mr. Berg's ability; he is a man of his word, and to my knowledge, at all times has successfully carried out any and all his undertakings.

Yours truly."

In the light of the many failures experienced by the four-motor vehicle companies, some of the above lines are amusing, although perhaps not more so than Berg's own statement that "I have yet to find a man who could surpass Mr. Berg's ability.

Berg's Underwriter's Agreement

Berg wrote to George M. Seward, a Chicago banker of the firm of George M. Seward & Co., 108 La Salle street. This letter related to arrangements for underwriting an auto company Berg was trying to float in Chicago, similar to the Detroit, Philadelphia and other projects. Berg himself wrote the underwriters' agreement and submitted it to Seward. Paragraphs from the letter on that occasion, written Nov. 14, 1906, are as follows:

"The principal feature of the underwriters' agreement, which you can take up between George M. Seward & Co., party of the first part, and the underwriters, parties of the second part, is that you can hold every individual underwriter for the amount he subscribes as soon as the underwriters' agreement is fully subscribed. While if you put the clause 'appointing a committee,' as outlined in paragraph four in the printed underwriters' agreement, the parties who you get to subscribe may expect you to dispose of their holdings and give them stock for lending their names. You can tell them this, without agreeing to it. Thus you would not be liable to do any more as a company than as stated in the underwriters' agreement. Of course you can suit yourself about these things.

"Of course all the matter which I have outlined to you in the prospectus and in the underwriters' agreement is merely suggestion. You have the 'meat' of it, and you can rearrange the rest of it to suit yourself, as long as the parent company gets their 25 per cent of the stock for granting the license to your company, and I, as president of the Imperial Electric Motor Company, can agree in private contract to turn back to you any stock difference that may be added to the $375,000 and that you may wish to cover up in the form of the underwriters.

"You can state that you went all over Europe to find a suitable equipment for the project, and it was not until after your return to this country, and examination into the four-wheel drive equipment in Philadelphia, that you decided upon this, finding it had no equals or rivals. Everyone knows your connection with the street railway equipments and would know at a glance that you are capable of adopting the proper equipment that would protect your company and the investors for years to come."

Another Foreign Enterprise

The Commercial Electric Truck Co., of Russia and Sweden is the title at the head of still another Berg prospectus, but apparently he did not succeed in launching this corporation. The prospectus states that this company is to be capitalized at $800,000 to manufacture trucks under the four-motor system, and to have the exclusive right to these patents in Russia and Sweden. The prospectus states in glowing terms that two trucks per day can be turned out by the corporation at an estimated profit to the company of no less than $2,000 per truck, or $4,000 per day, showing a net revenue to the company of $1,200,000 per year.

Some Lucky Stockholders

But to revert back to the local company, The Citizens' Transit Company., Berg saw that the local situation was fast slipping from his grasp, so he set about to interest his Philadelphia associates in the Citizens' Co. The result was that they subscribed $10,000 for stock, $5,000 of which was treasury stock, and the other $5,000 was paid for stock picked up by Mr. Reed in miscellaneous lots, some of it as low as $2 per share. Hoyt Post and Dr. Book gave Reed blocks of stock for no money consideration at all, so willing were they to part with it.

Well, that $10,000 gave the Philadelphia people a total of 800 shares, which was a controlling interest in the Detroit concern, and on October 2, 1906, the following officers were elected: President, Russell Thayer; vice-president, James O. G. Duffy; secretary and treasurer, Frank Brown, all of Philadelphia. Thus did the much-heralded electric bus line that was to operate in opposition to the street railways culminate. There are still large numbers of Detroiters holding stock certificates.

Mr. Beller was not the only one, however, who managed to get some of his money back. D. W. Simons forced Mr. Berg to pay him back a few thousand dollars that he had put into the Berg projects, both in Detroit and St. Louis. He did this on the threat of exposing him to his Philadelphia associates. Mr. Simons went right down to Philadelphia and caught Berg right on his favorite stamping ground.

Reed may also meet with some measure of success in getting back some of his money. It was he who tied up the big Imperial car with litigation, his claim amounting to $416.65, principally for salary as manager of the sight-seeing car. This claim

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the Philadelphians have settled for $325. In addition, Reed has started a suit in Philadelphia against Berg to collect some of the money he had paid him for stock.

More could be written about Berg's operations throughout the country, but it would be merely repetition of what is already told. Meanwhile Berg is said to be in London and almost any day his former Detroit associates expect to hear that he has organized a $5,000,000 company with King Edward as president.

WORK FOR MILITARY WAGONS

IT now begins to be evident that the interest which military experts have for some time past been showing in the performances of motor wagons is soon to be turned to good account. The adoption of the machines upon an extensive scale cannot be much longer delayed in view of the high opinion which is entertained of their value by the war authorities in every country. The latest advices from Europe credit General Picquart, head of the army in France, with a desire to test the motor wagon in commissariat service during the course of the next military maneuvers. To this end he has addressed a letter to the national automobile club wherein the following significant passages occur:

"The progress realized by the automobile industry in the building of industrial vehicles, and the results obtained both in the recent trials and during the maneuvers of 1906, encourage me to attempt this year an important experiment in regard to the utilization of commercial cars for the victualling of armies in campaign.

"It is my intention to provision the troops who will take part this year in the maneuvers by means of motor wagons. These maneuvers, which will extend over 12 days, will take place at the end of August and the beginning of September in the region of Bordeaux, Angouleme, and Limoges. The vehicles, concentrated at points where the commissariat will be installed, will run in convoy and have to cover a daily distance, with load, of about 50 kilometers, and the same distance empty on the return journey. In order to ensure the efficiency of the service, it will be necessary to engage about 40 wagons, each of a minimum transport capacity of three tons, but they will probably not be required to carry loads of more than two tons. These wagons will have to be provided with tarpaulin covers in order to protect the commodities with which they will be loaded (bread, sugar, coffee, oats, hay, etc.)

"For every unit of horse power, 86 centimes (17 cents) per day per vehicle will be allowed as remuneration to the contractors, and fuel, oil, and grease will be provided by the military authorities. Two men will have to be furnished with each vehicle by the manufacturers. These employes will have to undergo a period of instruction as reservists prior to the maneuvers, and during the operation will be allowed 2f. 50c. per day each as pay.

"Will you kindly take the necessary steps with the manufacturers and duly inform me of the nature and characteristics of the vehicles placed at my disposition, and also of the fuel it is proposed to employ. A depot for repairs will be installed in each locality in which the lorries will be concentrated."

SAN FRANCISCO BUS COMPANY

LAST month the attention of readers was drawn to the formation of the Western Rapid Transit Company, which is capitalized at $250,000 and proposes to operate 100 motor buses in San Francisco at a uniform fare of five cents. For some time past the company has been running a few 50 hp. gasoline machines for the purpose of testing the value of bus service in the western metropolis. Seats in these machines, which accommodate 30 passengers, have been in such demand that the company soon perceived that an increase in their numbers would be appreciated by the public. Its engineer is now in the east endeavoring to make arrangements for the manufacture of a large batch of cars, which will be double decked and modeled after the design of those now operating in Paris.

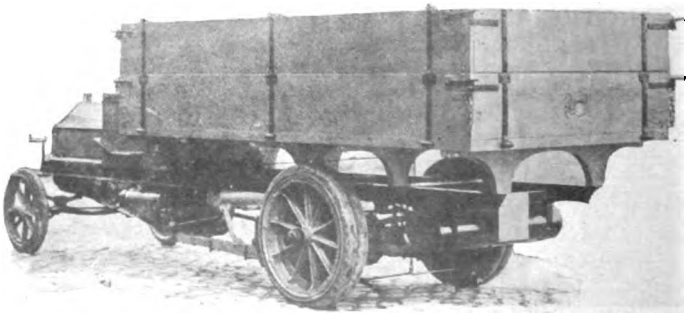
The inability of the local street car company to transport all who desire accommodations on its vehicles is well recognized in San Francisco, but what is not so well known is the fact that for a good many years to come its service will be worse than it is at present. These are exceptionally favorable circumstances for the introduction of the motor bus upon a large scale.

MORE WORK FOR MOTOR MAIL WAGONS

OWING to the refusal of the street railway company to handle mail matter at the maximum rate allowed by the government, namely, 3 cents a mile, it has become necessary for the Milwaukee postal authorities to use another motor wagon in delivering mail to Allis, Hale's Corners and Mukwanago. It was intended originally to deliver mail to the outlying districts by means of interurban cars, Assistant Superintendent Hickman of the railway mail service having investigated the plan and reported favorably upon it to Washington. But the street railway company declined the business at the rate offered, $600 a year, asking $900.

The New York Taxi— Cab Company, with capital stock of $500,000, has been organized to operate motor cabs in the metropolis. The directors are H. N. Allen, G. H. Engelhard and C. C. Reeve, Jr.

The Auto Express and Trucking Company has been organized to do business in Philadelphia. The capital stock of the concern is $250,000.



Wagon in the Service of the Bavarian Royal Traffic Department. Every possible encouragement is being given to motor traction by the Bavarian traffic authorities.

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Demonstration At Show Time

Preparations Being Made to Demonstrate Wagons During Week of Chicago Exhibition

PLANS are being matured to publicly demonstrate the superior advantages of the motor wagon in city transportation during the week of the Chicago industrial motor vehicle show. The Chicago Motor Club, which has charge of the matter, has not yet decided whether the demonstration shall be competitive in character or broadly definitive of the superiority of machines in work usually assigned to draft animals. Its present inclination is to eliminate the element of competition, letting the vehicles establish their utility and economy without regard to their relative engineering merits.

It would be decidedly unprofitable to attempt a demonstration which would have no other result than the comparison of machine performances. Purchasers of motor wagons are not so much interested in knowing which is the best wagon on the market as they are in seeing the economy of any or all machines well established. Before the final selection of machines for a given service can be made, other matters than speed, load capacity and reliability have to be considered. The gross ecenomy to be derived from their employment may be very seriously affected by an injudicious choice of the vehicles which entail more stable and administrative expense than is necessary. Experienced power wagon users will have no difficulty in understanding what is meant by the statement that a machine of relatively inferior speed and load capacity might easily be employed to better advantage in a given service than a machine having greater power, greater speed and greater potential usefulness.

It is one of the disadvantages of public demonstrations that they accomplish so little that is not already well understood in the commercial world. Still it should be possible without catering to those who wish to see a competitive display of the usefulness of commercial motor vehicles, to conduct a demonstration which would prove that the economy of a machine of orthodox design is not artificially sustained, but that there is hardly a transportation service now performed by horses which cannot be much more economically undertaken by motor wagons. Let us suppose that wholesale grocers are in doubt concerning the value of the machine. The surest way to dispel this doubt is to show what the motor wagon can do in such service, care being taken that the particular work assigned to the demonstrating wagon is typical of the body of it. Similarly with coal carrying, brewery transportation, dry goods delivery, express work and other forms of haulage, both light and heavy, for long and short distances. In short, mass demonstration of selected services. The variations in transportation services of a given class are not so important as to call for special demonstrations for each individual firm. For all practicable purposes it is enough to show the inferiority of horse haulage. Once this is broadly established purchasers may safely be entrusted with the duty of selecting the type of machine which is best suited for the work under consideration.

Although no active canvass has been made for the purpose of procuring the support of exhibitors at the show, further than the announcement which was made of of the undertaking, it is gratifying to observe that applications for space continue to be received at the office of the management. Among the recent applications for space are the General Vehicle Company, of Long Island City, the Studebaker Automobile Company, of South Bend, and the A. D. Meiselbach Motor Wagon Company, of Milwaukee.

MOTOR BUSES IN NEW YORK

ANNOUNCEMENT has been made that several motor bus lines will be operated in New York by the Manhattan Transit Company some time this month. If plans do not miscarry one line will start from Cortland street ferry, cross Brooklyn bridge and run to the Flatbush avenue station of the Long Island railroad. Another will run down Broadway from 14th street to City Hall and across the bridge to the Brooklyn Borough Hall. A third line will run down 5th avenue from 125th street to 14th streets with branches east and west on 14th street. It is promised that transfers will be made from one line to another.

The Manhattan Transit Company came into existence a year ago. It is controlled by John C. Sheehan. At the time of its formation the company purchased an old franchise held by the General Carriage Company to operate stage lines through the city. Recently the Long Acre Electric Company was absorbed by the new corporation, and then John C. Sheehan announced, when the new subways were advertised, that the Manhattan Transit Company would, in all probability, be a bidder. When the Seventh, Eighth and Lexington avenue routes were advertised, however, the Manhattan Transit Company submitted no bids.

The company claims the right to operate buses over all streets and bridges under the law which gives automobiles the right to travel thoroughfares open to other vehicles.

There are many streets in New York where the motor bus could be used to advantage. Some of these are too narrow to accommodate street car traffic, and yet they are thoroughfares between busy points. The passenger traffic between the North River ferries and steamer wharves and the City Hall and Brooklyn bridge section would be better accommodated no doubt by the motor bus than by any other means of transit. The extension of the usefulness of this very convenient vehicle at a very early day is more than probable.

The Dreadnaught Power Truck and Transportation Company, of Chicago, has been formed with a capital stock of $50,000 to do a general transportation business.

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NEW MILITARY CAR

LITTLE has been heard lately of the armored and turreted motor vehicle, with quick firing guns, which was stated to be in course of construction for the Russian government in a German workshop. European military opinion now inclines to the employment of lighter vehicles of a less formidable character which may be used by staff officers.

The German war authorities are now testing an especially constructed vehicle in which the vital parts are encased in thin steel and the under parts raised so as to lessen the risk of injury when crossing rough ground, but the ordinary form and appearance has not been departed from. Cartridge boxes, map table, and a rack for a folding bicycle are fitted inside. Outside the body are stands for three carbines and a collapsible arrangement for bridging ditches. Very low gear is provided so that the car can keep pace with marching columns. A new type of fan is fitted, which is effective in preventing overheating.

The Birmingham, (Ala.) Auto Transfer Company has been formed to carry freight and passengers. The officers of the concern are: N. O. Tyler, president; W. A. McWhorter, first vice-president; T. E. Morris, second vice-president and general manager; F. T. Patterson, treasurer, J. L. Tyler, secretary, all of Birmingham. The main office of the company will be in Birmingham.

Automobile fire-fighting apparatus will be shown at the annual convention of the Pennsylvania Firemen's Association, which will be held in Pittsburg this month. One of the exhibits will be a chemical wagon driven by a six-cylinder gasoline engine.

Electric trucks, cabs and buses are to be operated by the Bowman Transfer and Storage Warehouse Company in Richmond, Va., a corporation recently organized with a capital stock of $50,000.

CONCESSIONS FOR GASOLINE TRUCKS

AS a recent result of the agitation conducted by the American Motor Car Manufacturers' Association, gasoline trucks are now admitted to the New York City piers of the Enterprise Steamship Co., the Brunswick Steamship Co., the Maine Steamship Co., the New York & Porto Rico Steamship Co., the United Fruit Co., and the Ward line.

MILITARY TRANSPORT WAGON

THE French military authorities have found a new use for the power wagon. Two vehicles are employed to transport water in metal barrels to forts distant from natural supplies. Both are of special construction. One is fitted with a 28 hp. engine. It is chain driven and can carry loads of 3,500 kilograms.

The Pine Brook Auto-Stage Company has been formed with a capital of $20,000 to operate motor buses in the vicinity of Pine Brook, N. J.

Light freight is being carried by motor wagon between Clarksburg and Greensburg, Ind. Clarksburg has no railroad lines, and supplies have been hauled by horses from Greensburg for many years. The merchants recently bought a motor wagon at a cost of $1,600 to transfer their goods between the two points.

There are five electric motor buses operating in London. These are the first of a batch of 50 which were promised for delivery last December.

A motor stage line is operating between Picture Rocks and Montgomery, Pa., with Muncy as an intermediate point. The length of the journey is 20 miles.

A motor hose cart and chemical wagon to cost $4,200 has been bought for use by the Ringgold hose company of Newburgh, N. Y.

Supplying Fuel to a London Motor Bus

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Reaction Follows Boom

Foreign Makers of Motor Bus Chassis Inactive Because Operative Companies Will Not Buy

PROPRIETORS of motor bus enterprises in London, both great and small, are not buying rolling stock with the same freedom which marked the beginning of operations or the trade history of last year. This is partly accounted for, in the case of small companies, by the lack of capital, original purchases having exhausted all the funds that were available for plant account. No such excuse, however, can be offered for the hesitancy of the large buyers, the well financed companies who are in control of the bulk of bus passenger transportation. They seem as cautious now, where fresh investment is required, as formerly they were incautious. Many of them have been "stung," to use a descriptive term of the period, in their eagerness to outstrip rivals in the competition for trade accepting construction which could not fail to be disappointing in the arduous service of the metropolis. Hence it is easy to believe they are "marking time," as an observer puts it.

Other features of the existing situation are thus described in a transatlantic contemporary:

.. The undue haste of 1905 naturally produced a fit of indigestion, in that operating companies were unable to provide either organization or personnel in keeping with actual requirements, and the police next stepped into the picture with ruthless hand when liberty of license had been abused beyond the limits of public endurance. The feverish eagerness of most owners to push out the vehicles at all cost has been followed by disillusionment for those well-meaning but unqualified gentlemen who enter the lists as competitors for a share of passenger transport in the metropolis, while others "whose domain is finance" have been forced to admit their under-estimation of the difficulties which beset the traffic problem. Some few have lined their pockets, it is true, but we doubt very much if these opportunists have gained in reputation or have created any lasting friendships by their actions. A transient period of apparent victory must not be confused with the issues of a sustained campaign.

It is equally ridiculous that far-reaching inferences should be drawn from the results of ill-managed and insignificant companies, several of which class have "gone under" during the last few months, and whose practical failure is being attributed to the action of the police. As a matter of fact the police would have been false to the duties which are entrusted to them did they stand idly by and, in response either to pleas for sympathy or specious excuses, allow obviously hopeless combinations of noisy vehicles and inefficient supervision to drag on their weary course to inevitable disaster at the daily cost of the public convenience. Police action is not the cause, but rather the effect, as the determining factor, once a motorbus is licensed to go into commission, is the condition in which its owners maintain it. We protest, therefore, against the wholly absurd reports which have been circulated by some of the smaller companies that have now reached the end of their tether, and whose promoters are looking for an explanation to provide an appearance of justification for voluntary liquidation. Let them, rather, explain why they were ever brought into existence, or, at least, why they proceeded to allotment on a miserably insufficient subscribed capital, in preference to their making this attack on the police as a last resort.

The shame of these useless promotions, whose glamour has been a short-lived one, cannot help but affect the larger and older companies prejudicially, and it is for that rason we are constrained to make a statement about the latter classes of undertaking. Nobody can deny that the more influential companies have been, and are still, passing through a period of serious change and rapid evolution. The boast of the purely motorbus directors, that they had no "dead" capital "on their backs" in the shape of obsolete rolling-stock and equipment, has, in at least one case, counted for precisely nothing, since the very men who used that argument are now in charge of a balance-sheet which discloses over $1,750,000 of paper capital. It has, thus, soon come about that the really large groups are very much on a par with one another as to financial responsibility *qua* useful plant, and all of them are face to face with the question of the future. Experience, in the shape of improvements to chassis, has been, in some cases, added to capital account, in that the cost of alterations so charged have nearly balanced the provision for depreciation, but it must be obvious that this course cannot be taken for more than two years at the most. On the other hand, experience, in respect of centralized repair organization, is saving huge amounts weekly, and has already given promise of a total effective improvement which, having regard both to maintenance and earnings, is not unlikely to reach as much as 1d. per vehicle-mile, as a marginal difference between operating costs and revenue, in the year's accounts.

With such possibilities before them, who can blame the proprietors if they have paused in placing large orders? Makers of chassis are, no doubt, very disappointed, but they realize the real occasion for this policy of concentration and steady organization. They know there has been too much play given to personal consideration in regard to the management of London's motorbuses, and they are, at heart, though discouraged by the lack of London orders that has been their experience during the past six months, conscious that "stage number one" is nearly over. There are a few more managers and directors to undergo rude awakenings as to the degree of close attention that is demanded if motorbus operation is to be successful; there are a few out-of-date and obstructive officials to be pensioned or retired; there will have to be a reversion to many of the penny stages which obtained until the motorbus appeared.

STATISTICS OF GERMAN INDUSTRY

AT the commencement of this year, when a census of motor vehicles was taken in Germany, it was discovered that the actual number of machines employed in road freighting was 1,211, subdivided as follows: Delivery wagons up to 8 hp., 516; delivery wagons up to 16 hp., 313; delivery wagons up to 40 hp., 126; delivery wagons over 40 hp., 2; motorcycles, tricycles, etc., 254.

There is not much doubt that America leads in the use as well as in the production of commercial motor vehicles of every kind, with the exception of those employed in public passenger transport. Germany takes fourth place in the nations using power wagons and trucks, being outranked by the United States, England and France in the order mentioned.

Of vehicles employed in public service, such as buses and cabs, Germany has 1,126 vehicles. Of this number Berlin has 565, the Province of Brandenburg 255, Rhineland 77, Silesia 34, Hanover 25, Hesse-Nassau 25, Bavaria 37, Baden 37, Saxony 30, Wurtemburg 28, and Alsace-Lorraine 13.

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Motor Fire Apparatus

Operating and Maintenance Cost of a Service which is well past the Experimental Stage

MORE than enough evidence has been accumulated, and presented in these pages from time to time, to indulge the hope that within a very short time the horse drawn fire vehicles of every important city and town in the United States will be superseded by motor driven apparatus. Much of the information disclosed by us touching the economy of motor fire vehicles has, directly and indirectly, come to the knowledge of all the experts in the country having to do with fire prevention, in which class is included municipal executives and insurance companies, and it is gratifying to realize that the interest thus aroused has been so profound as to cause many municipalities to enlist the services of the National Bureau of Manufactures in verifying all that has been printed.

For reliable and carefully compiled statistics of the experience acquired through the employment of motor driven fire apparatus we must go abroad. Our consular agents, therefore, in such countries as have enjoyed the advantages of modern fire prevention methods were naturally requested by the Bureau to report upon what they had observed in this field of endeavor. Our comercial agent at Hanover was the first to respond. His report, which follows, is an interesting document from whatever point of view regarded. It is technical enough to interest the student and comprehensive enough to attract and hold the attention of the taxpayer. Such omissions from the text as those interested in comparative finance would wish supplied can easily be found in preceding issues of this paper which have dealt with all forms of this important subject. The consul writes:

Hanover, Germany, was the first city to purchase a complete automobile fire-engine service, consisting of engines, hose-carts, and hook and ladder kit. The system is past the experimental state as most of the apparatus has been in service now for a period of five years. It has proved itself entirely satisfactory and more economical than the horse-drawn engines and carts. It must be understood, however, that the streets in Hanover are well paved and flat, there being very slight grades. The most of the buildings are comparatively modern, a large number of them being of "slow burning" type; many others are intended to be fireproof. Strict construction laws have been enforced to guard against fires. Labor, fuel, and alcohol are cheap: coal is moderate in cost and fair quality. So all conditions have been most favorable for success. The relative cost (in marks of 23.8 cents each) of the automobile and the horse-drawn equipment under the conditions at Hanover are as follows:

	Horse-drawn. Marks	Auto-mobile. Marks
First cost	46,500	55,000
Maintenance, first year	36,500	25,000
End of first year	83,000	80,000
Maintenance next five years	182,500	125,000
Total	265,500	205,000

The balance in favor of automobiles is 60,500 marks ($14,399). Hence these will have saved a sufficient sum to pay for themselves. An advantage of the automobile machine is its comparative shortness, which enables it to turn shorter in the engine house and yard and in narrow streets. The automobile equipment in Hanover consists of three machines: A carbonic-acid machine for one foreman and four men; a hydrant wagon for one officer, one foreman, and five men; a steamer, with one officer, one engine runner and four men. The first two are electrically driven, the last one steam driven.

Description of Carbonic-Acid Machine

The carbonic-acid machine cost $3,643 without extras. The weight empty, is 5,495 pounds; battery, 2,447; water, 882; extras, 470, and five men, 825 pounds; making a total of 10,119 pounds. The permissible useful load, including boiler contents and fittings, is 2,640 pounds. The batteries take up 54 by 46 by 17 inches. The maximum speed is 9.9 miles an hour; one battery loading suffices for 15.5 miles. The construction in inches is as follows: Diameter of hind wheels, 46; diameter of front wheels, 34; between axles, 87; gauge, 58; length of machine, 184, and height of machine, 97. The water tank is at the rear, between the two lengthwise sills; the two gas holders, each with 17.6 pounds of gas, are on the platform. The battery is forward and can be inspected by raising the front seats. There are two hose reels, each with crank on each side, and above these a hook and ladder kit. There are two motors, each driving a scar wheel, through 8½ to 1 spur and pinion gear. The motor switch is around the steering wheel. There is a cut-out switch with aluminum key to prevent unauthorized persons throwing in the current. Near this there is a socket for connecting an electric hand lamp for inspecting the machine. In slowly running forward the two four-pole motors are in series; at full speed, in parallel, in which case they deliver 2.5 normal and 4.3 maximum hp. each. The 2.5 hp. are generated at 79 volts and 600 turns. In electric braking the motors are switched out, short-circuited, and reversed, making them act then as generating dynamos. Long grades up to 8 per cent and short ones up to 10, can be mounted.

Cost of Operating

The current consumption per kilometer (0.62 mile) is, including all losses, 0.8 kilowatt hours, or 6.6 ampere hours. With a charging current of 45 amperes, it takes for loading six and one-half minutes per kilometer run. The charging current is continuous at 121 olts. The expense for current is at 0.8 kilowatt hour at 121 volts. The expense for current is at 0.8 kilowatt hour, per machine kilometer and 2,000 kilometers per year per machine, and 20 pfennigs, or nearly 5 cents, per kilowatt hour, nearly $80 per year; for forming the battery, $19.04; for acid, distilled water, isolazit, hydrogen and oxygen, solder, paraffin, etc., $15.47, so that the running expenses are under $115 per year. The gas heater uses 14 cubic meters, or 494 cubic feet, of gas per twenty-four hours, at 9 pfennigs per cubic meter, say 30 cents per day. For a call are needed 53 pounds of carbonic acid, 5.28 gallons of spirit, and 22 pounds of charcoal briquettes. The cost of running to a fire is figured at 13.50 marks, or under $3.75. The under frame is of steel tubes connecting the rear with the front axle. The motors, which are axially in line and parallel to the rear axle, swing about their own axes in a case attached to the axle and having spring bearings. The frame is divided crosswise. The front part of the frame surrounds with its conical tube ends a cross tube of the rear frame, and the front end of the rear frame is supported by a transverse spring on the front frame. Thus the machine is not sprung in running on road surfaces that are "winding." The three-point support is a desirable feature. The rear frame has spiral springs; the wagon box proper three leaf springs. The wheels have hickory spokes; the tires are made of solid rubber. The tires of all machines are guarranteed for 10,000 kilometers, or 6,214 miles run. This is about five years' work for the Hanover engines at the present rate.

Description of Hydrant Machine

The hydrant machine cost $2,522.80, exclusive of extras. The weight, empty, is 5,034 pounds; battery, 2.451; fittings, 1,446,

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and seven men 1,162 pounds. The permissible useful load is 2,646 pounds. The battery takes up 54x46x17 inches. There are nine seats. Greatest speed, 9.9 miles. One charge lasts 15.5 miles. The dimensions in inches are as follows: Diameter of hind wheels, 46; diameter of front wheels, 34; between axles, 98; gauge, 58; length, 190, and height, 79. The battery is under the lengthwise seats, but well back; the front-seat box is used for tools. There are four ladders forming the backs of the seats; the wagon box has also a double bottom in which there are two hook ladders and a pole ladder. Below the wagon box is a chest for coal for the steamer. There are two hose reels and a third (removable) below the hook ladder.

The Steam Machine

The steamer cost $3,930, exclusive of extras or fittings. The weight, empty, is 7,585 pounds; water, alcohol, coal 1,050; fittings, 286 and six men, 1,056, a total of 9,976 pounds. There are five seats and standing room for one. Maximum speed, 12.4 miles per hour. Tires, solid rubber. The construction details are as follows: Diameter of rear wheels, 40.6 inches; diameter of fore wheels, 34.6 inches; distance between axles, 89.4 inches; gauge, fore wheels, 55 inches; gauge, rear wheels, 57.8 inches; length, without hose cart, 171 inches; height to top of closed telescopic stack, 86 inches; capacity per minute, 264 gallons; maximum steam pressure, 10 atmospheres; total heating surface, 60.5 square feet; and grate surface, 4.1 square feet. The pump and its engine are each double cylinder, vertical, inverted, double acting. Between pump and boiler is the 10-hp. double-cylinder Stevenson link reversible engine for the drive; this is controlled from the driver's seat and drives through sprocket and chain. The driving wheels have on their felloes internal gears for the drive and a drum-like surface for the band brake. This latter is only for emergencies. Steering is from the driver's seat. One man steers, the other manages the driving engine. The boiler is kept heated when in the house by a gas-burner, so that the water is about 100 degrees Centigrade or 212 degrees Fahrenheit, although four atmospheres' pressure may be obtained. When an alarm is rung the engine is first run by compressed carbonic acid from two cylinders of 22 pounds gas each. During this period the boiler is heated by denatured alcohol, sprayed into the fire box by the pressure of carbonic acid from a cylinder holding 2.2 pounds through the Korting jets, which direct the flame on 22 pounds of compressed charcoal briquettes, so that on the arrival at the fire full steam is up. Reducing valves are used for the gas cylinders. From this point on coal or coke is used. The alcohol tank holds 9.25 gallons, and steam pressure is raised at the rate of one atmosphere per minute. The gas pressure on the alcohol is 2½ atmospheres. The jets have a diameter of 0.02 inch. The alcohol flame is free from sparks and the machine runs noiselessly. The 9.25 gallons of spirit lasts for twenty minutes. The steam exhaust is silenced by a condenser under the front seat, as in the case of a steam passenger automobile.

Operating and Maintenance Cost

On February 19, 1906, the automobile apparatus, consisting of the electrically driven carbonic machine and hose cart and steam driven pumping engine, completed its fourth year of active service. The cost of maintenance for all repairs to the two electrically driven apparatus figured out as follows: First year, $51.90; second, $147.81; third, $106.38; fourth, $163.47. The running expenses of the two electrically driven apparatus were each year as follows:

	1902-3	1903-4	1904-5	1905-6
General running expenses of the electric part of the apparatus	$162.85	$146.49	$123.78	$137.33
Cost of current for testing and reforming accumulators	38.69	17.97	42.00	33.80
Cost of keeping up the accumulators, plates, acids "Isolazit," etc.	21.94	37.83	174.77	551.11
Lubricants—bone, oil, fat, etc.	5.36	6.66	5.17	5.17
Total for upkeep	$228.84	$174.95	$345.72	$727.41

Thus for repairs and upkeep of the electrically driven apparatus the totals were: First year, $280.74; second year, $322.76; third year, $452.10; fourth year, $890.97. Both electrically driven machines have run in the first year 2,340 miles; in the second, 1,934; in the third, 2,033; and in the fourth, 2,263 miles; the expenses being 7.47, 7.64, 13.80 and 27.78 cents per mils, respectively, at an average of 12.44 cents per mile, as against the cost of 56.30 cents per mile for horse-traction; the cost of this latter being taken at $952 a year for each apparatus. The steam automobile pumping engine cost for the first year, $177.67; the second, $120.79; the third, $347.91; the fourth, $205.03. For the entire equipment the total running expenses were as follows:

1902-3	$280.82 +	$177.69 =	$358.49
1903-4	238.11 +	120.79 =	358.90
1904-5	451.57 +	347.91 =	799.48
1905-6	990.97 +	205.03 =	1,196.10

In Hanover the cost of horses for an equipment of three machines is estimated at $2,856. The adoption of automobile traction has been economical to the extent shown by the following figures:

1902-3	$2,856 less	$458.48 =	$2,427.52
1903-4	2,856 less	358.98 =	2,527.02
1904-5	2,856 less	799.48 =	2,056.52
1905-6	2,856 less	1095.89 =	1,851.11

Total saving in four years $8,862.17

The original cost of the three self-propelling apparatus was as follows: Gas driven pumping engine, $3,641.40; hose cart, $2,522.80; and steam-pumping engine, $3927; total $10,091.20. The new fire chief expresses himself as much pleased with the performance of the apparatus introduced by his predecessor.

CHASE COMPANY ORGANIZED

WITH a capital of $40,000, the Chase Motor Truck Company, of Syracuse, has been organized to build industrial motor vehicles and engines. The incorporators are Aurin M. Chase, Austin C. Chase and Hiram P. Bellinger, all of Syracuse.

Passengers and freight will be carried by vehicles owned by the Union Motor Car Co., of Union, S. C., which has a capital of $15,000. The vehicles will ply for business in Union and between that point and Monarch.

BUS SERVICE IN CANADIAN CITIES

MOTOR buses of American manufacture are to be operated in Toronto. Five electric vehicles have been purchased and are now in commission. It is reported that electric bus service will also be afforded to the inhabitants of Montreal, Ottawa and other principal Canadian cities.

A motor parcel post service is operating between London and Ipswich. Two vans cover the route in the schedule time of 7½ hours.

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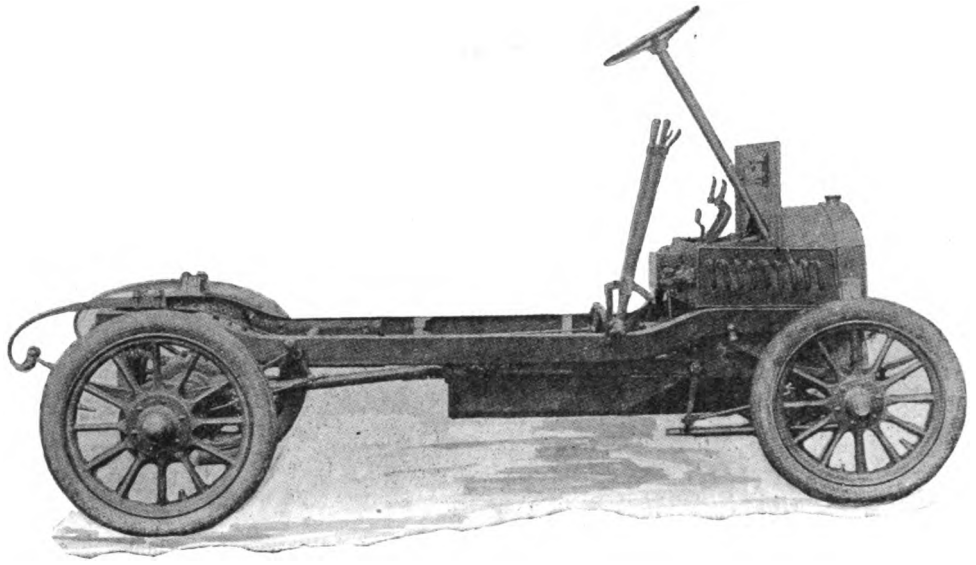
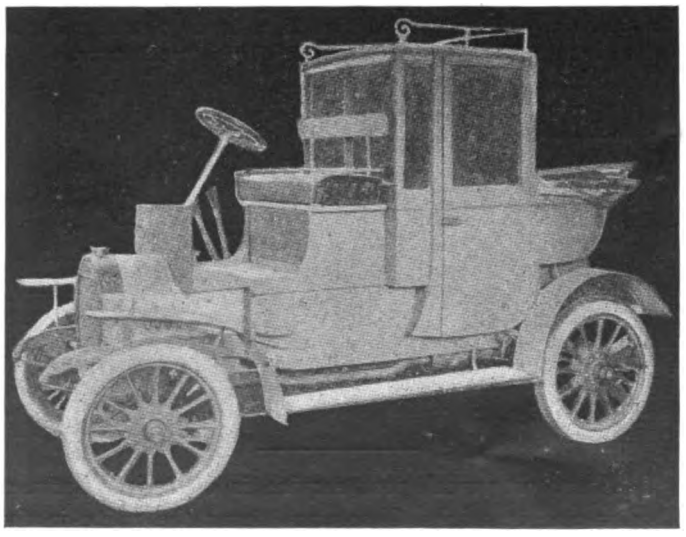


Chassis of London Motor Cab, Weighing 1400 Pounds, Only Part of Engine Being Placed Under the Bonnet.

Interesting Cab Construction

Design Which Aims at Avoiding the Employment of Expensive Touring Car Parts

ONE of the principal horse-drawn cab companies of London, owning 500 vehicles and 2,000 animals, has recently become so much impressed with the force back of the industrial motor vehicle movement that it hastened to commission an engineer of ability to design a motor cab which would prove superior to those now on the market and which, as all know, are in the majority of cases assembled from touring car parts. Some of the stockholders of this company are connected with the directorates of several motor bus companies, and the experience gained from these latter connections has taught them that the construction of public service vehicles requires the exclusive attention of designing engineers if the machines are to made remunerative. The company's instructions, therefore, to the designer of its new cab were to make it light in weight, simple in construction, with large carrying capacity so as to insure high earnings, but particularly to make its working parts interchangeable so that in the event of trouble they could be quickly replaced or repaired. As a result the company has a cab which differs in many important particulars from those now on the market. It seats four passengers. It is equipped with a two-cylinder vertical engine which develops twelve hp. at normal engine speed of 850 revolutions per minute. Magneto ignition of the high tension variety is fitted. Only part of the engine is under the bonnet, a form of construction which at first glance might seem to cause delay in effecting adjustments or repairs. The simplicity of the engine construction and the convenient placing of its parts, however, justify this feature of design. Carburetter, throttle valve and inlet fuel pipe can be removed by unscrewing four nuts and uncoupling the pipe union. In the event of serious trouble with these parts they can be replaced with another set, while adjustments or repairs are being made on the set out of commission. Thermo-syphon cooling is employed. The gear box and crank case are constructed of malleable iron, which while not so light as aluminum, the metal usually employed in these parts, has the advantage of being much cheaper. The extra weight resulting from this seclection of material is compensated for by the general lightness of the vehicle design, the chassis weighing only 1,400 pounds. A very wide steering lock is a feature of the design, enabling the vehicle to be manipulated in the most crowded traffic. The machine is bevel gear driven. The body is designed with especial regard for the character of service in which the vehicle is to be employed. The driver's seat is placed high. The roof and baggage rail is carried forward in order to enable the driver to conveniently handle the pieces which may be placed upon it.



London Cab to Carry Four Passengers; Roof Rail Con veniently Placed in Proximity to Driver.

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Team Owners Lose Heavily

Owing to the High Temperature 150 Draft Animals Drop Dead in Kansas City

It is with good reason that team owners welcome the approach of the cool fall weather. During the hot season the mortality among draft animals is very high.

That the casualities due to high temperature have not been as numerous as usual this year is no sign that the breed of horses is improving, or that their owners have learned wisdom from the past. The abnormal coolness of the passing summer has spared the lives of many horses which otherwise would have been sure to succumb to heat and overwork. And yet during the few days of immoderately hot weather which have marked the expiring season enough animals perished to indicate how great the loss might have been if conditions had been less favorable. In Kansas City, with the temperature in the nineties, 150 horses dropped dead in a single day.

* * *

Appalling as is this waste of animal life, it is by no means expressive of all the mischief that is worked to draft animals during the heated term. The number of horses which are incapacitated for work during warm weather is many times greater than the number which die from exposure to it. In the summer months team owners expect a very low efficiency from stable equipment. The animals are easily tired and drivers are instructed to be cautious in working them. Thus the volume of merchandise transported by a given number of animals, supposedly in sound condition, is very much less than in the more exhilarating months of the year. The capacity of the stable is further crippled if disease, not peculiar to hot weather, gets a foothold in the stable. This varying capacity is practically unknown in motor wagon transportation.

Centuries of experience with the horse in transportation does not seem to have inured him to the hard conditions of service. He continues to be the bad commercial risk which he was in the beginning. He collapses under the severity of his work and is sent to pasture, or continues to render service and dies from heat and overwork. Sanitary science and veterinary skill have made the poor brute's life more comfortable than it used to be, but his grip upon it is just as insecure as it ever was. He is better policed and not so frequently abused, but his serviceability to his masters does not increase in degree as he is better cared for. If he breaks a leg he is not shot, as was formerly the custom. The bone is set, the limb put in splints, and he is slung up in a hospital from which he later issues forth to perform humbler service than was formerly assigned him. But thousands of animals perish annually from glanders, colic, kidney troubles, tuberculosis, pneumonia, rheumatism and heat prostration. It is not to be expected that man who cannot keep himself in health can keep the life in horses.

The diseases to which a motor wagon is subject are not seasonal in character. Nor are they nearly so numerous or perilous as those which affect horses. The machine's anatomy may become deranged, but its constitution never. If it fails to function properly it can be repaired, and if the repair is skillfully executed the vehicle becomes as useful as it was the day it issued from the factory. Its life can thus be prolonged indefinitely. Repaired horses are ever impaired horses, until in the end they die.

* * *

If one were to institute a comparison between the efficiency of draft animal and motor wagon transportation during the periods of the year when each is supposed to be at its best and worst, the balance would always be struck in favor of the machine. We have seen how inefficient horse service is in summer, animals dying from heat, partial loads only being carried, and drivers being cautioned not to overexert their charges. It is notorious that motor wagons perform their best work in hot weather, street and road conditions being then such as to present few obstacles to superior traction. A motor wagon which in winter is purchased with the expectation that it will do the duty of two or three horses will in the summer do the duty of five or six horses.

Years ago when the art of administering motor wagons was little understood either by makers or users, the machines were housed when a heavy snowfall made traction for any kind of vehicle difficult. Things are differently ordered nowadays. Machines are expected to keep the street throughout the year, and do so when backed by a vigorous administration.

As an instance of the machine's ability to cope with the worst conditions of winter, take the trip of a two-ton wagon from Detroit to Chicago last February. This journey, the details of which were fully recorded in this paper at the time, excited considerable astonishment, for from start to finish it was full of impediments which it was generally believed could not have been surmounted by a commercial motor vehicle. Snow drifts, slippery inclines, and solidly frozen ruts marked every mile of ,the way, and yet the machine reached its destination without having once stopped to make a repair.

In city winter work, when much snow is on the ground, the efficiency of a gasoline wagon is not impaired, though the fuel consumption may be slightly increased. Operating under such a condition electric vehicles show a diminished mileage for current consumed, and to this extent are less useful than gasoline machines. But when there is much snow the service of both types is decidedly superior to that afforded by draft animals.

Under the best conditions of service which could be imagined for horses, namely, level streets and moderately cool weather, the superior speed and load capacity of the power wagon give it an overwhelming advantage.

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Reliability of Wagons

Two Demonstrations Which Prove How Nearly Automatic the Machines Are

DESPITE the fact that thousands of motor wagons are daily employed in hauling enormous stores of merchandise, performing their work with unremitting regularity and making money for their owners, many prospective purchasers are prevented from immediately investing in them because of a vague fear that they may refuse to function properly in their inexperienced hands. This timidity, which is most notable in the class which contemplates the purchase of gasoline wagons, will wholly disappear when it is generally understood that the vehicles are as nearly automatic in action as it is possible to make them. Meanwhile time and labor can be profitably spent in showing how dependable they really are.

* * *

Every day sales of gasoline vehicles are being made to concerns which are unable to boast the enrollment of a single workman having experience in driving any kind of an automobile. Whatever difficulty is encountered in first attempting to master the machine soon vanishes if precautionary measures have been taken to make the operator acquainted with the simple uses and interrelation of its various parts. Technical knowledge of the vehicle's construction is not required in order to operate it. Barring the engine, the working parts of a gasoline wagon are as simply constructed as those of a sewing machine, which millions have learned to use with a high degree of skill. And, thanks to the patient endeavor of men who make a specialty of engine construction, this part of the machine is robbed of many terrors it was wont to inspire in the uninitiated. If its functions are not interfered with the engine will run as long as there is a charge of gas to be exploded. There is no reason why its employment should give rise to any more apprehension than comes from the employment of a horse, for which in effect the machine is a substitute..

In the beginning a gasoline wagon is certain to behave well. In fact its dependability could be guaranteed if the operator is not a blockhead. It is only after it has been in service for six months or so, and the inevitable wear of working parts begins to become noticeable, that the operator is really called upon to exercise his knowledge of the machine. By that time, however, assuming that he is a man of ordinary capacity, he must be possessed of enough skill to diagnose and cure the trifling ailments to which the machine is subject. Axles, tires, wheels, clutch, driving devices, steering apparatus, change speed gears, and the other parts of a motor wagon need not cause the novice any uneasiness. They function without thought on his part, and only need to be watched for wear.

* * *

Two events well calculated to test the reliability of the power plant of gasoline vehicles are being much discussed just now by owners of touring cars and commercial vehicles. As there is practically no difference between the engines of automobiles for pleasure and business, the results obtained from these demonstrations are as applicable in one field as the other . Out of the forty-one machines entered for competition in the recent motor wagon trials jointly supervised by the Automobile Club of France and representatives of the army, twelve finished the 2500 mile run without the slightest mishap to any feature of construction. . Nearly all of the vehicles entered would have qualified for award if smoothness of power plant operations had been the only requirement for success. In the sealed bonnet contest recently conducted by the Automobile Club of America, 87 per cent of the machines entered traveled 700 miles in four days without requiring any adjustment of engine parts. From performances so noteworthy as these only two conclusions can be drawn: (1) that the bulk of automobile engines are highly efficient; (2) that when trouble occurs and a vehicle is compelled to pause in its journey, blame for the delay is to be ascribed to negligence on the part of the driver, or to conditions external to the vehicle, rather than to any structural shortcomings.

* * *

Prior to the Automobile Club of America's sealed bonnet contest it was thought that only a few prizes would be needed for distribution among the successful contestants. As it turned out forty-one machines earned trophies by having perfect scores. This incident in itself would not be worth recording if it did not indicate that, even in circles where the state of the art of automobile construction is supposed to be well-known, there are many people who are profoundly ignorant of the high degree of excellence to which engineering design has actually attained. Before the test in question was held the sanity of a well informed clubman would have been doubted if he had predicted that more than five machines would have been able to comply with the requirements for successful competition. Automobile users with less enlightenment did not dare to hope that more than one or two machines would have emerged from the four-day contest with a record of perfect achievement.

The cost of a motor chemical wagon, $4,500, is being raised by popular subscription in Visalia, Cal. The cost of a horse drawn chemical wagon, by the way, varies from $2,500 to $3,500, without horses or harness.

With a capital of $200,000 the Owens River Automobile Transportation Company has been formed in Los Angeles, Cal., to establish a transfer line from Mojave to Keeler, Bishop and other places in Nevada and California, with eating houses and repair shops. The Directors are E. G. Gilbert, E. M. Clagg and George E. Darling.

Motor buses run three times a week between Polson and Ravalli, Mont.

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ANOTHER WHOLESALE SUBSTITUTION

IT is highly probable that the close of the present year will witness the supersession of horse drawn buses by machines in the service of the Parmelee Transfer Company, of Chicago. At the latest the substitution will occur next spring. When the change takes place 230 horses and 78 horse drawn vehicles will be retired.

The company also intends to make extensive use of motor wagons in its baggage transfer service, in which 350 animals and 120 wagons are employed.

The company's manager, Charles McCullough, has for a long time been impressed by the economy to be derived from the employment of machines instead of animal labor. He confidently predicts the near approach of the time when horses will no longer figure as factors in large cartage and passenger transfer operations in the downtown streets of Chicago. This opinion is confirmed by what fell under his observation while studying transportation conditions in New York and other eastern cities.

MOTOR BUSES TO DO WORK OF 400 HORSES

WITH the auction sale of all of the Fifth Avenue Coach Company's 400 horses, omnibuses, stages and harness the last of the stage coaches has passed away from New York. Motor buses, with a fare of 10 cents, have replaced the old system on Fifth avenue. The first public stage made its appearance in New York, June 9, 1830, and ran hourly between Wall and Bleecker streets. In time the stages ran on the principal streets and connected all important points of the city. They came in time to represent an invested capital of more than $1,000,000.

MAIL WAGON WORK IN PHILADELPHIA

AN outline of the work to be performed by the mail collecting motor wagons authorized for Philadelphia has been furnished by the postmaster at that point. The machines are to be employed in the collection of packages, newspapers, etc., from boxes located in the city proper. The distance to be covered will be from fifteen to twenty miles per trip, making from sixty-five to one hundred stops on each trip, and three trips per day, except Sundays and legal holidays. Each trip must not consume more than two hours and thirty-five minutes, or eight hours for the day's work, as that is the legal limit per day for the employment of letter carriers.

The postmaster at Los Angeles, Cal., has been authorized to employ motor wagons in the collection of mail. The vehicles will carry a clerk to attend to the stamp canceling machine, and outgoing mail will be sent direct to the mail cars at the railroad station instead of going through the post office as heretofore.

Motor buses are operating between Utica and Clayville, N. Y. If the service is successful it will be extended to Cassville, Bridgewater and West Winfield. A fare of 30 cents is charged for the trip from Utica to Clayville, which is made in half an hour.

ONE MOTOR WAGON'S WORK

PEOPLE who know nothing of the capability or durability of a motor wagon are often tempted to inquire if its cost of maintenance and usefulness can be guessed at in advance. While there is never any hesitancy in making reply if operating and service conditions are known and guaranteed constant, it would be folly to make answer without being so fortified.

What tonnage a motor wagon will haul in the course of a year or in ten years, what mileage it will traverse, and what will be its cost of operation and maintenance, are matters which entirely depend upon its load capacity, its speed, the care it gets both in and out of the stable, and the degree of skill shown in keeping it actively and well employed.

Given the operating and service conditions, however, it is comparatively easy to show the superior usefulness of a motor wagon and prove that its cost of maintenance is not subject to any serious fluctuations. In support of this contention we submit a table which a large firm of brewers prepared for the purpose of showing what service was obtained from its 3-ton truck, the machine in question having been commissioned six years ago:

	1st Year	2d Year	3d Year	4th Year	5th Year
Interest at 5%.....	$ 162.50	$ 162 50	$ 162.50	$ 162.50	$ 162.50
Depreciation at 15%.	487.50	487.50	487.50	487.50	487.50
Cost of running, everything included	1916.24	1531.66	1766.52	1735.70	1532.44
	$2566.24	2181.66	2416.52	2385.70	2182.44
Miles covered	6455	6602	5932	7189	6377
Tons carried	1336	1273	1451	1492	1470

This wagon, with steam for motive power, originally cost $3,250. It is still in good condition, doing the work of six horses, and two horse drawn vehicles. Note how the work capacity of the machine was increased at the same time that the cost of operation was decreased.

SIGHT SEEING CARS MUST KEEP MOVING

AS a result of a legal decision procured by the police authorities of New York City, the owners of sightseeing cars have been notified that their vehicles will not be permitted to stand for any considerable length of time at street intersections, or otherwise obstruct traffic. Latterly merchants located on Broadway have been complaining of the behavior of the officials attached to these big machines, the drivers being accustomed to bring their vehicles to a stop while the lecturers, using a megaphone, take their time in describing objects of local interest. Hereafter only five minutes will be allowed for stoppages at street intersections.

The war minister of France has authorized the purchase of four of the heavy motor trucks which were successful in the recent trials. In addition he has allowed each of the makers of these trucks a premium of $257. Forty motor trucks will be used in the next maneuvers of the French army.

The Swiss army authorities will use 2½ ton motor trucks during the coming military maneuvers.

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Motor Wagon Operation

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

FUEL consumption in wagons of like carrying capacity and like manufacture varies in the most surprising manner. There are four elements that bear directly on the amount of fuel a given car will need for each mile run. The first is perfect carburetion. The second is economical transmission from engine to road wheels. The third is flexibility of engine, whereby the machine is enabled to run on highest gear at low speeds. The last is a knowledge of how to drive the machine economically.

Failure to Start on Switch

After a wagon has been in service for some time it occasionally becomes necessary to inject gasoline in the compression cocks before getting started, though investigation proves that the compression is good and the motor shows no failure when under way. With such a condition and misfiring, particularly when throttling down, it is likely that something is wrong with the carbureter. If adjustment of the carbureter does not give relief, it may be that the fault will be found to lie in the gasoline in the float chamber. For some cause or another the level may have got reduced. To facilitate starting on the switch, the ignition should be shut off before the throttle is closed and the latter should be kept open until the motor ceases to revolve.

Poor Compression

The fault of poor compression often lies in some defect in the valves or their seatings, or else in an escape past the pistons. The valves should first be seen to. There must be an uninterrupted bright line round the valves and the seatings, on testing them by wiping them clean and twisting under pressure. If these are all right it is possible that the valve stems are a shade too long, so that when warm they do not allow the valves to shut properly. If no fault can be detected here the pistons and rings must be overhauled. Before taking them out a test can be made by giving a dose of kerosene to the pistons to thin out the oil around them, then trying the compression and listening for a noise of escaping air when the starting handle has been pulled to the point of greatest compression. It may turn out that new rings will be required. It has been found in practice that when new piston rings are fitted to an old cylinder—by old we mean a cylinder that has been in use some few thousands of miles—they do not hold the compression for nearly so long a period as the original set.

Vibrator Troubles

A possible but somewhat unusual cause of sticking of the spark coil vibrator is residual magnetism in the iron core of the coil. This may be corrected by reversing the battery connections occasionally. It may be found that the vehicle must be driven some miles after reversing the connections before the tendency to stick disappears. Another possible cause of the same trouble is in the armature of the vibrator making physical contact with the end of the core. It is possible to have the brass or copper rivet attaching the armature to the spring project slightly through the bottom face of the armature, so that iron cannot meet iron. If, however, the vibrator is so badly adjusted that the rivet touches the core it will soon wear flat, and the proper remedy is to adjust the vibrator so that the armature will have no tendency to touch. The trembler must be three-sixteenths inch from the core.

Keeping the Steering Gear in Condition

If the streets and roads are in a slippery and muddy condition it is important to keep the steering gear in the best possible shape, as a break is more liable to allow the wagon to slide or skid into some obstruction before the brakes can bring it to a standstill.

Keep Testing the Brakes

Brakes should be tested at the start of every run, and if found wanting in holding power the driver should there and then proceed to adjust them. It is gross negligence to use a wagon knowing the brakes to be indifferently set. The best test of a brake is to stop midway up a stiff hill. It should be possible to hold the wagon with either the foot or the side brakes. One method of testing the rear brakes is to jack up both wheels and apply the side lever notch by notch. After each notch the wheels should be pulled round by hand to see that the brakes grip evenly. When both are locked, so that they cannot be revolved, there should still be a good quarter of the notch quadrant left for further application.

FUEL CONSUMPTION OF RAIL MOTOR CARS

OF late persistent attempts have been made to make it appear that the fuel cost in operating gasoline motor rail cars is so considerably greater than the fuel cost which attends the operation of other coaches designed for similar service as to practically forbid the use of the former. It has been asserted, with what justice will presently appear, that the fuel cost of operating gasoline rail coaches is as high as $7.50 per hundred miles. The Union Pacific gasoline motor rail cars are operated at a cost of $3.36 per hundred miles for fuel. This cost has been ascertained after examination of the records of operation for more than two years. If the cost of fuel for a gasoline rail coach ever reached the figure first mentioned, the car must have been of a type not now regarded as acceptable by engineers.

Backed by French capital a company has been formed to operate 100 motor cabs in Buenos Ayres.

The police department of Chicago is constructing, at the municipal workshops, a 70 hp. patrol wagon, capable of carrying a large squad of men to the scene of any unusual disturbance.

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

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Danger of Buying French Cabs

Delivery Contracts Cannot be Enforced Though Courts Decree Otherwise

SOME of the worst as well as some of the best public service motor vehicles issue from France. Like the little girl with the curl upon her forehead, when such machines are good they are very, very good, but when they are bad they are horrid.

The American promoters of New York's two gasoline motor cab companies doubtless pondered a good deal over the source of supply before placing their orders with French factories. Probably they reasoned that as such machines as they required were not procurable at the moment in the home market it was imperative to buy abroad, where apparently plenty of them are to be had. Others have made the same mistake. In the early days of motor bus and cab enterprise English operators found themselves in a similar situation. They looked to France for the equipment they could not obtain at home. Bitter experience, however, has taught many of them that it would have been better to restrain the impatience to buy until such time as the native industry could have been got in shape for production.

* * *

The French automobile industry is largely supported by its foreign trade. Without the income from this source French production would languish. It is, as the organs of trade continually lament, only the rich, the very rich, who purchase automobiles in France. Other automobile producing nations are hard put to it to take care of native demand, and consequently export trade is little cultivated by them. From this it might be imagined that French factories are peculiarly well situated to take care of foreign orders. Such, however, is not the case. Productive facilities are notoriously inadequate the world over, and distant customers are often disappointed. Forfeit money binds buyers of French products to their contracts, but apparently leaves the sellers free to do as they please. Deliveries are wholly at the discretion of the latter.

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A short time ago it was given out that the capacity of the best known motor cab factories in France was engaged for a period of two years to come. Whether this was intended as adroit advertisement for the companies in question, or was reasonably representative of the truth, it would be idle to inquire. In all probability it takes color from both suppositions. The interesting thing about this statement is that it apparently has no significance for New York customers who are swollen with the thought of getting from 600 to 900 machines from these self same congested factories within the space of six months. This is obviously impossible without placing their orders ahead of those already in hand, to do which would be suspiciously like double dealing. If, therefore, the New York motor cab companies shall succeed in obtaining deliveries as promptly as they anticipate, a miracle will have been worked.

* * *

There is nothing in the history of French automobile export trade which indicates that it is conducted in the same even handed manner which characterizes the foreign trading methods of other producing nations. On the contrary, there is abundance of evidence to show that many far off customers have suffered severely as a result of the faith which they too implicitly placed in the ability of French manufacturers to make shipment according to contract. A single instance will suffice to show the risk which attends dealing with French makers.

When the Automobile Cab Company of London

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first considered the employment of gasoline machines it decided to buy its equipment in France. Its stockholders were told that as soon as 200 vehicles were put in service a dividend of 20 per cent per annum could easily be declared. After many delays the company succeeded in getting 32 cabs in the first year. As a result of this inadequate equipment, and high fixed expenses, a loss of $48,940 was sustained between November, 1905 and July, 1907. The president of the company, brought to account by the shareholders, declared that the loss was due to the unfortunate fact that the "factory of the producing company was in France," adding that "it would be difficult to obtain redress on account of delayed deliveries even though judgment should be obtained in the English courts." The French producers, on the other hand, set up the claim that delay in delivery was due to a strike among its workmen. In the situation it is not surprising that this palliating explanation was not accepted as satisfactory by the concern which is a loser by the transaction.

The French cabs in question cost $1,700 apiece at the factory, which is about the price the New York cab companies expect to pay for their vehicles. The London company, whose disastrous experience has just been cited, testifies that its imported machines were of a type which "the directors regretted to say did not come up to their expectations." The vehicles appear to have been too light for service, so much so that 40 per cent of them were daily undergoing repair after they had been in service a very short time.

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Many London motor bus companies which at the beginning of operations were tempted to buy French machines, had similar experiences. Eventually they perceived the unwisdom of such a course of policy and now are trading at home. After most careful consideration the United Motor Cab Company of London has decided to place side by side with its French machines a large number of English made vehicles. The British made bus is gradually superseding the French bus in London, the figures standing at 360 for the former to 538 for the latter, a proportion which will be better understood when it is stated that for the first two years of the service foreign machines were almost exclusively used.

The opportunity for foreign cabs in this country at the present moment may not be doubted. Their permanency in our markets cannot be so confidently predicted.

MOTOR BUSES ON LONG ISLAND

WHILE the thought of employing motor buses in the development of real estate projects is not new, its application has not been undertaken until recently. The owners of a large tract of land at Jamaica, L. I., known as the Jamaica Estates, upon which four thousand model detached homes are to be erected, finding it necessary to supply transportation service, have decided to make use of buses, each of which will accommodate 22 passengers. The machines will run at short intervals over the fine boulevards of the Jamaica Estates, carrying property owners to and from the Long Island Railway station at Jamaica.

The charge for motor bus service to residents on the Jamaica Estates will be arranged on a yearly basis, it being the intention to make the charge for transportation merely nominal. During the period of house building the vehicles will be operated for the convenience of all who desire to inspect the property.

While present plans only contemplate bus service between the Estates and Long Island station at Jamaica, it is not improbable that eventually the service will be extended to Manhattan via the Hillside boulevard which borders the Estates, Hoffman boulevard, Blackwell's Island bridge, which is now nearing completion, East 60 street and Fifth avenue

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Sixty-six of the 90 motor buses operated in Paris are always in service. Six machines are constantly held in readiness for emergency work. This gives a vehicle service efficiency of 80 per cent. The efficiency could be raised if it was not the custom to overhaul all vehicles once every fortnight. Five lines are being operated. The daily distance covered by each vehicle is 90 miles.

TAXI-CAB COMPANY'S PROGRAM

BEFORE the winter has passed the New York Taxi-Cab Company, formed to operate Darracq motor cabs in the metropolis, hopes to have 300 vehicles in commission. It anticipates deliveries from France at the rate of 60 machines a month. Eventually it expects to put 600 of these vehicles on the streets of New York.

As the capacity of the Darracq factory is only rated at 3,000 cabs, and European customers have already posted forfeit money for the delivery of the bulk of them, it seems likely that the Taxi-Cab company will have to modify its ambition and be content with what machines the producers can spare for trans-atlantic shipment.

The vehicles will be fitted with four cylinder engines developing 14-16 hp. The rate of fare will be 30 cents for the first half mile and 10 cents for every additional quarter mile. An extra charge will be made for crossing the ferries. Additional charge will also be made for traveling up town further than 125th street. The waiting charge will be $1 an hour.

The turning radius of the cabs is 22 feet. Ignition is of the high tension variety. Axles are ball bearing. Valves, placed on one side of the engine, are mechanically operated. Gear box, rear axle and engine are easily dismounted.

Only two manufacturers deemed it worth while to enter their product in the three day commercial motor vehicle contest held by the Cleveland Automobile Club last month.

Motor bus service is being supplied between hotels at Cape May and Ocean City, N. J.

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Gasoline Bus Running Along Central Park in New York.

New York's First Buses

Fifteen Gasoline Machines are Being Operated on Fifth Avenue at a Ten Cent Fare

FOR two months past fifteen gasoline motor buses have been operating on Fifth avenue in New York City. The vehicles are the property of the New York Transportation Company. The fare is ten cents.

Under ordinary circumstances the announcement of such an undertaking, which marks the first attempt in this country to employ the gasoline bus in metropolitan passenger service, would occasion only the pleasantest reflections. But it is impossible to be without regrets upon learning that only the bodies and tires of the vehicles were made in this country. The chassis is French in design and construction, the parts of which, received in knocked down condition, were assembled in this country in order to save excessive import duty charges.

* * *

Although eventually the vehicles will ply for trade in many parts of the city at present they are being operated over a very short route, from Washington Square to Nineteenth street, a distance of four miles. One hour is allowed for the round trip, including a five-minute stop at each end. The average speed is ten miles per hour. The machines are run under a five-minute headway. Service begins at 7.00 in the morning and ceases at 11.00 at night. Each vehicle makes eight round trips daily.

The engines of the buses are rated at 24 hp. Each vehicle seats 34 pasengers, 16 within and 18 on the outside deck. No seat no fare is the operating company's rule. Though the Madison avenue and Sixth avenue street car lines parallel the route of the buses, and invite patronage at a five-cent fare, the road machines are well patronized. The street car lines mentioned are only one block east and west of the bus route. Ten more buses will soon be placed in commission, bringing the total up to twenty-five.

The decision to operate motor buses on Fifth avenue was not reached until the New York Transportation Company had experimented with a single machine for the better part of a year. During this period the test vehicle gave little or no trouble which could not have been quickly remedied if such spare parts as inlet valve springs, cotter pins and platinum interrupter screws had been kept in stock. No adjustment of clutch or brakes was found necessary. Transmission and final driving gears have shown very little wear. The tires, although too small in section, have stood up well, helped by the easy riding springs which tend to very materially reduce the hammer blow caused by passing over rough surfaces.

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The wearing parts of all the machines now in service are case hardened, glass hard and ground to size. The framing is of ash, reinforced with 3-16-in. fish-plates on both sides. The cross-stays are of channel section pressed steel, and ample rigidity is secured by sheet gussets riveted to longitudinal and cross-members. This rigidity, however, is all lateral, the frame being to some extent flexible vertically. The springs are extra long, of easy curvature and very well proportioned to the weight of body and passengers, so that vibration is very slight. The tires are 36 x3 inches twins on the rear wheels, and 34x3 1-2 inches on the front wheels.

The bodies are of the typical London type, having

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longitudinal seats inside and transverse seats on the top. The end windows are removable. The side windows are permanently closed, ventilation being obtained by louvers and small ventilating windows in the sides over the large windows. The winding stairway is of very light sheet steel and wood construction, protected by a high railing to prevent accident in case the bus should start suddenly. The body is easily removable, having no connection whatever with any part of mechanism, brake rods, etc., and being fastened to members of the frame with eight carriage bolts.

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The engine is of the four-cylinder vertical type, with high-tension ignition, working either from the magneto or dry cells by a two-way switch. The carburetor is heated by shunt pipe from the circulating water. The lubrication is automatic. The transmission is of the sliding-gear type, having four gear ratios and a progressive engagement of gears. The gears are very light and of comparatively small diameter. This is admissible owing to the large reduction of gear ratio between the driving pinions and the internal toothed driving rings on rear wheels; that is, the gears run at high speed and are subjected to comparatively small torsional stresses and toothed contact pressures. The gears are made of chrome nickel steel. The differential gear and countershaft are incorporated in the gear box, thus conducing to compactness and efficiency, owing to the elimination of extra bearings. The lubrication of the gears is by a gear oil pump fitted to the bottom of the gear box, similar to the one used on the engine, this pump delivering oil to all the bearings and also to a pipe parallel to the gear-shaft and located directly above it. This pipe is provided with holes directly above each of the gears. A constant stream of oil is thus playing upon the latter at all times when the vehicle is in motion, and practically no oil is lost, as special means are provided to prevent its escape.

The machines are easy to control. Two pedals are provided, the right one being the clutch pedal, and the left one actuating the differential hand brake and also closing the throttle. A change-speed lever and an emergency brake are at the right of the driver. Either the differential brake or hand brake will lock the rear wheels on asphalt. The clutch, which is of the single disc metal-to-metal type, is smooth and easy in engagement, and the bus can be started on the top speed owing to the gradual way in which the clutch picks up the load. When driving in traffic it is not necessary for the operator to remove either of his hands from the steering wheel, as the clutch, throttle and brake can be operated with his feet. The bus complete with water and fuel weighs 7,900 lbs., increased when loaded to 13,000 lbs. The speed is 12 m. p. h. on top speed at 1,000 r. p. m. This engine speed can be safely increased to 1,250 r. p. m., equivalent to 15 1-2 m. p. h.

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Notwithstanding all the harsh criticism which has been aimed at the motor bus—most of it inspired by malice and peddled to a public profoundly ignorant of the machine's commercial usefulness—street railway operators who are not misled by sentimental prejudice think well of it. One who has given more than ordinary thought to the question of its value as an auxiliary to fixed lines of travel, and who evidently fears the consequences of permitting its control to escape from the hands of those now virtually possessing a monopoly of wholesale city passenger transportation, thus rebukes vulgar opinion upon the subject:

The interesting feature of motor bus operation is its peculiar field of usefulness. No one will seriously consider the bus as an active competitor of the street railway, but rather as an adjunct of it, able to be of great use in its own especial sphere. We who build twenty-story cities need not be surprised at finding that we require concurrently every kind of rapid transit device to be imagined in order to make transportation keep pace with necessity. New York is literally growing at a rate that subway-building cannot keep pace with. One has only to use surface and elevated cars to realize that these, too, are inadequate, and so we can well afford to welcome the motor bus as one more helper in the good work. There seems good reason to expect that it will be of service, and any help is welcome.

If experience is a safeguard the motor bus cannot prove an economic competitor of the vehicle that moves on tracks. The cost of fuel, care and up-keep rises to a figure that probably forbids five-cent fares on any extended runs. The recent crash in the quotations of motor bus stocks in England, where the bus has had its widest development, proves that. But by the use of improved vehicles of double-deck construction a ten-cent fare may very likely prove remunerative. This difference makes the bus a competitor, not of street cars, but rather, we hope, of cabs. New York, we must with sorrow admit, has at once the most inadequate, the most insufficient, and the most extortionate public carriage service in the world. Foreign travelers would with justice scoff at it for its badness did they not curse it for its outrageous charges. We welcome with open arms any sort of vehicle that can help scourge it into comparative decency. This, perhaps, a well organized motor bus system will be able in time to do, and the sooner

Front View of New York Gasoline Bus.

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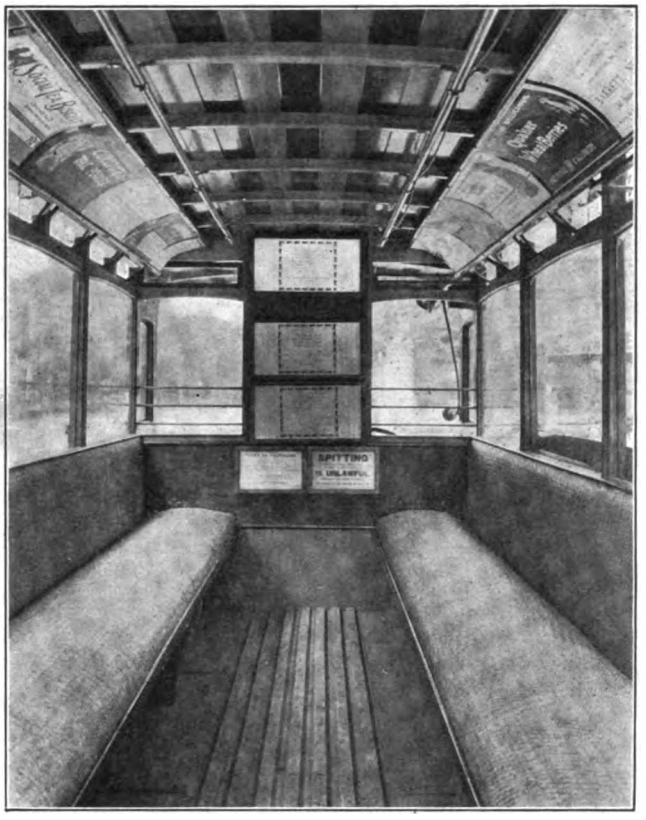
it comes with all the modern improvements the better for the metropolis.

The motor car certainly has a legitimate field in public service. It can never compete with the street car as the vehicle of the people, but it can do many things which the latter cannot do. Not being confined to a track it can work its way through crowded streets by judicious detours and can make, upon the whole, better time than a surface car. It can reach and serve streets that cannot well be equipped with tracks, and more than all, it can relieve people to a considerable extent of the Turpinesque ministrations of the metropolitan cabby.

There is another field in which the public motor car can do, and in fact is doing, admirable work. This is in the prosaic task of furnishing quick and convenient transportation at summer resorts. As a general rule such places, especially at the seashore, are not easily reached from the railway stations, and the season is too short to justify the construction of electric roads. Hence, one usually reaches through the last stage of the journey by an ancient and rickety barge drawn by a pair of X-ray equines. The situation would be funny were it less serious, but really the result is to render unavailable a very large amount of valuable territory. The time consumed in the last two or three miles is often equal to that required for a 20-mile run by train, and the resort that by the timetable was a mere hour away has slipped afield to an hour and a half. The motor bus exactly meets the requirements of such situations. It can make good time and give ample capacity at moderate cost, doing for the case in hand everything that an electric car could do. When the season is over and the resorts close, the motor bus is not an unproductive burden, but can be brought back to the city to keep up its earning capacity..

* * *

In the main this is a well sustained argument. Its greatest fault lies in the unfounded assertion that a five-cent fare is insufficient to protect metropolitan motor bus investments. If the London bus companies were not at war with one another, and did not also feel obliged to compete with the low fares offered by various surface and underground railways, they would be rolling in riches. Just now they are carrying pasengers at two cents a head,



Interior of New York Bus.

and holding their own in spite of the double handicap of bad executive management and poor equipment. The cost of operating motor buses in New York should not be greater than it is in London in any particular except wages, the increase in which item of accounting could easily be supported if the fare was five cents and the American vehicles were as liberally patronized as the British.

Gasoline Bus in Service on Fifth Avenue, New York.

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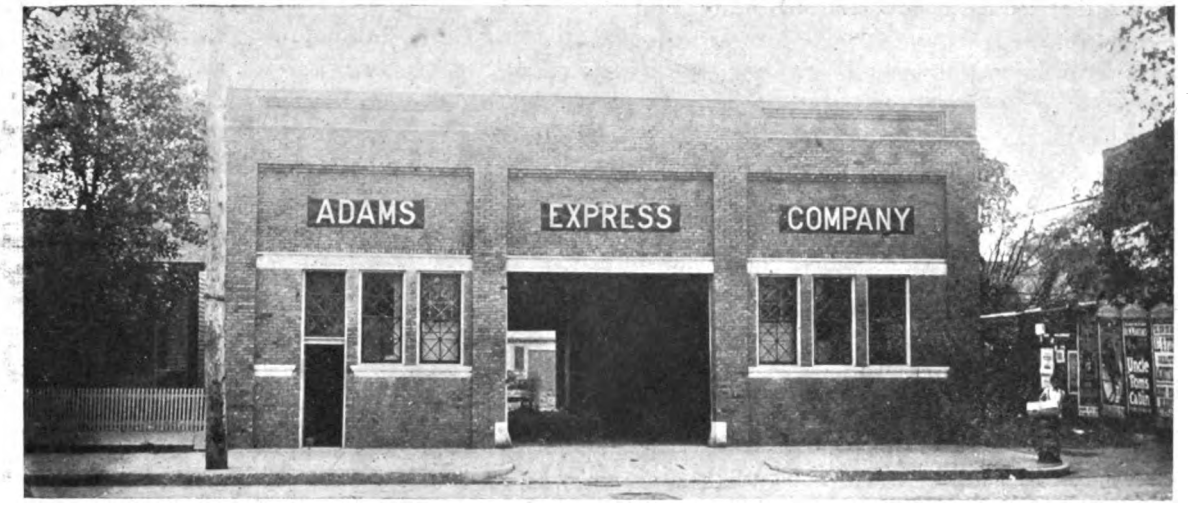

Electric Wagon Garage of Adams Express Company at Indianapolis, Housing Nineteen Vehicles.

Horses Entirely Abandoned

Adams Express Company Erects Electric Wagon Stable at Indianapolis and Installs 19 Vehicles

NINETEEN electric vehicles are now performing all of the street transportation of the Adams Express Company in Indianapolis. Horses have been entirely discarded.

The change was made last month, when sixteen one-ton delivery wagons and three two-ton trucks were put in commission. All the old horse routes were at once abandoned, new routes to accommodate the machines being necessary in order to give their economy the widest play. One of the light wagons will be used for the transfer of money packages. It will be worked harder than the others. If its battery mileage on a single charge should prove inadequate a spare battery will be kept in reserve for it. Extra batteries will not be required for the other vehicles, which are abundantly powered for the service expected of them. The light machines travel at a rate of 10 miles an hour; the heavier ones at 9 miles an hour. One battery charge is sufficient for 35 miles of service for each class of vehicle.

* * *

In making this change the company has liberated an investment of about $12,000 in horses, horse wagons, harness and stable furnishings. The draft animal equipment, which included 32 horses and 22 wagons, was maintained at a monthly cost of about $600, exclusive of drivers' wages. All the men who formerly drove the company's horse wagons have been retained to operate the power wagons, receiving as pay for their work sums varying from $50 to $55 per month. Three drivers who have not been regularly commissioned will be carried as extras, employed to operate the machines in emergencies, but generally to assist in delivery work. An expert battery man, and a representative from the factory which made the vehicles, soon licked these raw recruits into shape and taught them all that is necessary to know concerning emergency repairs, minor adjustments and the routine of handling the machines.

H. C. Brooke, the Indianapolis agent of the Adams company, has had full charge of the plans preliminary to the installation of the electric vehicle service. He is assisted by an experienced electrician who was formerly connected with the local street car company for fourteen years. The latter as foreman and general machinist has been given charge of the garage. He is aided by a battery caretaker, who charges the batteries at night, and an assistant machinist. These three operatives constitute the personnel of the garage. Their salaries aggregate $195 per month. The abandoned horse barn, with its 22 horse-drawn wagons, required the services of three men at about the same figure. The capacity of the electric vehicle garage, however, is about three or four times as great as that of the discarded draft animal stable.

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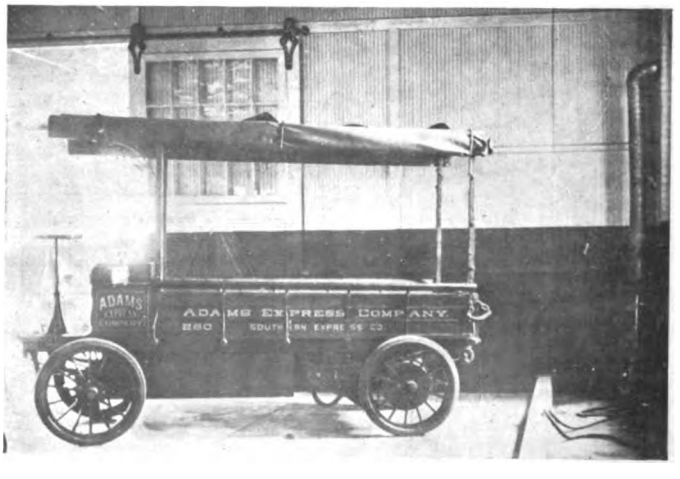
It will naturally occur to the reflective reader to inquire why nineteen power wagons should be required to perform the service hitherto accomplished by twenty-two horse-drawn wagons. As a matter of fact, there is a surplus of power wagons. With the experience which this



Washing Room and Heater in Adams Express Company's Indianapolis Garage.

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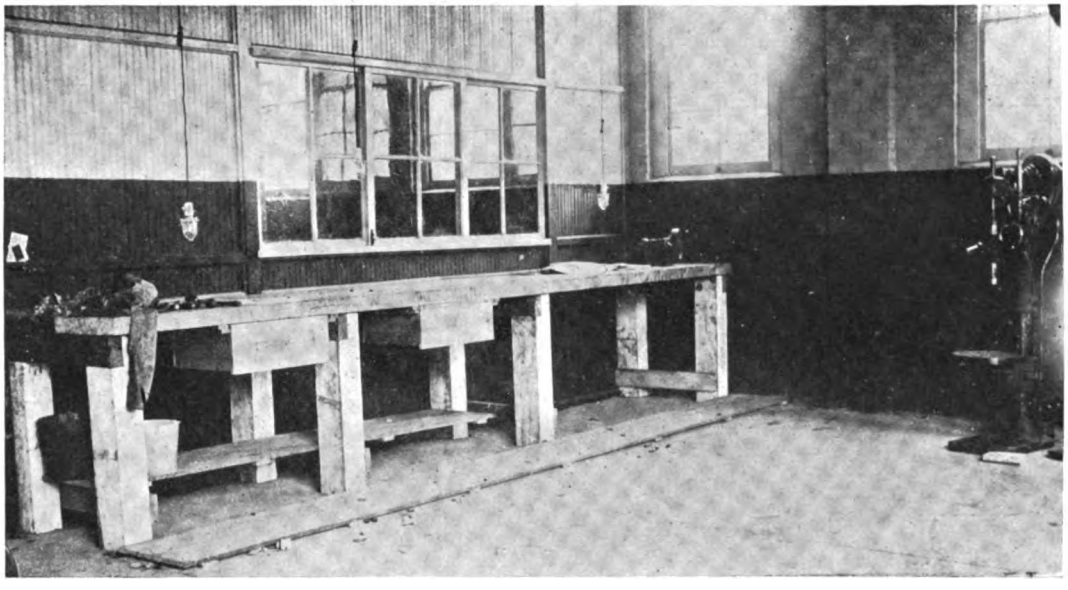
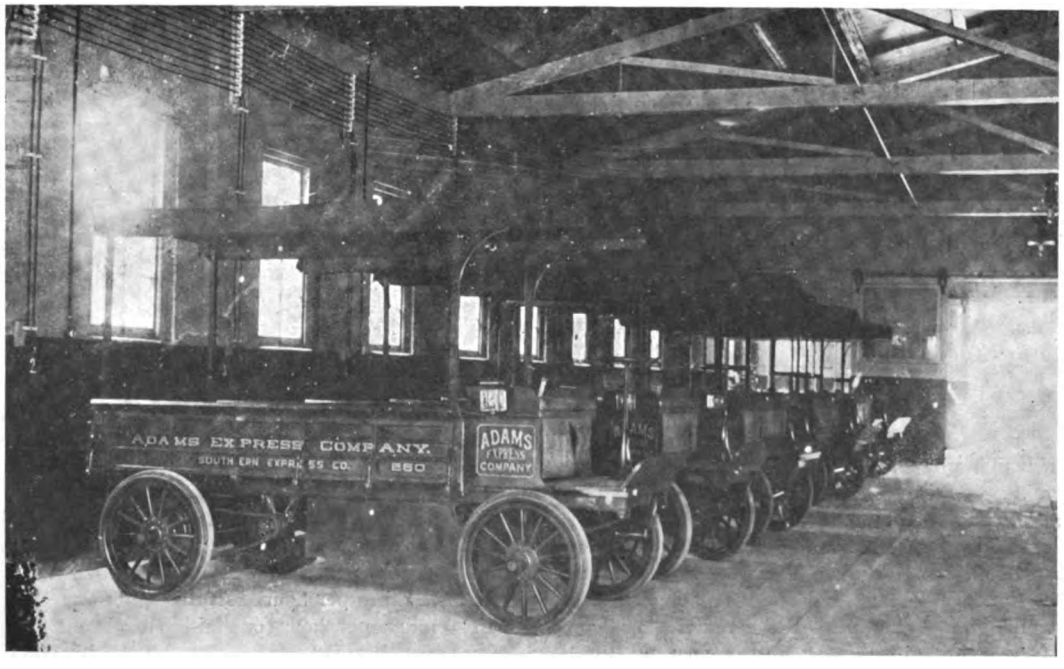
company has acquired from the operation of power wagons, it is altogether unlikely that it would substitute power wagon labor for draft animal labor upon an even basis, unless there were substantial benefits to be obtained by such an exchange. The express traffic of Indianapolis is growing with surprising rapidity. Merchants are constantly demanding more prompt local service. Thus, while at the present the capacity of the ninteen electric wagons is not taxed to anything like its limit, their reserve of usefulness may be called into action at any moment. This was the company's method when it first operated in Buffalo, in which city its machines have now daily assigned to them all the work which they can perform. The fact that the company deliberately decided to erect a garage at Indianapolis with room for twice as many machines as are at this moment required would further seem to indicate that it intends to greatly extend its present service.

The company's motor wagon installation at Indianapolis represents an investment of about $50,000, of which sum about $40,000 went for the purchase of vehicles and the balance for the construction and equipment of the garage. Permanency of motor vehicle service is evidently one of the company's cherished aims, as similar investments have been made in many other cities throughout the country. The Indianapolis garage stands upon real estate owned by the company. It is the most complete establishment of its kind in the city of Indianapolis, and one of the most complete in the west. It is built of glazed brick. The trimmings are of stone. The entire floor is constructed of cement. The striking feature of construction is the steel truss roof, built without center posts. No wood has been used in the construction of the building. Ample provision has been made for the future development of the delivery service, the garage having capacity for 21 one-ton trucks



Corner of Repair Shop in Adams Express Company's Indianapolis Garage.



View showing Arrangement of Rheostats in Adams Express Company's Indianapolis Garage.

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and 18 two-ton machines. The building is one story high, 50 feet wide and 117 feet long. It has two entrances, one in front and the other in the rear. In the rear is a large yard.

The garage is divided into three sections, the main wagon room, a store room and a repair shop. The wagon room is 90 feet long and the full width of the building. The store room is 25 by 18 feet; the repair shop is 25 by 32 feet. The store room and repair shop are located in the rear of the building. The repair department is equipped as an up-to-date machine shop. It contains a motor for running the machinery, a lathe, a drill press, forge and emery wheels, as well as a complete supply of all tools necessary in making repairs and adjustments. Electric current for charging and running the motor in the repair shop is obtained from the local public service corporation supplying light. If it should develop that the cost of current from this source is excessive, power will be produced on the premises of the company.

At a recent meeting of the street railway operatives union in San Francisco it was reported that the sum of $50,000 had been set aside from the strike fund to maintain motor buses in opposition to the railway company's street cars. A number of machines are in service.

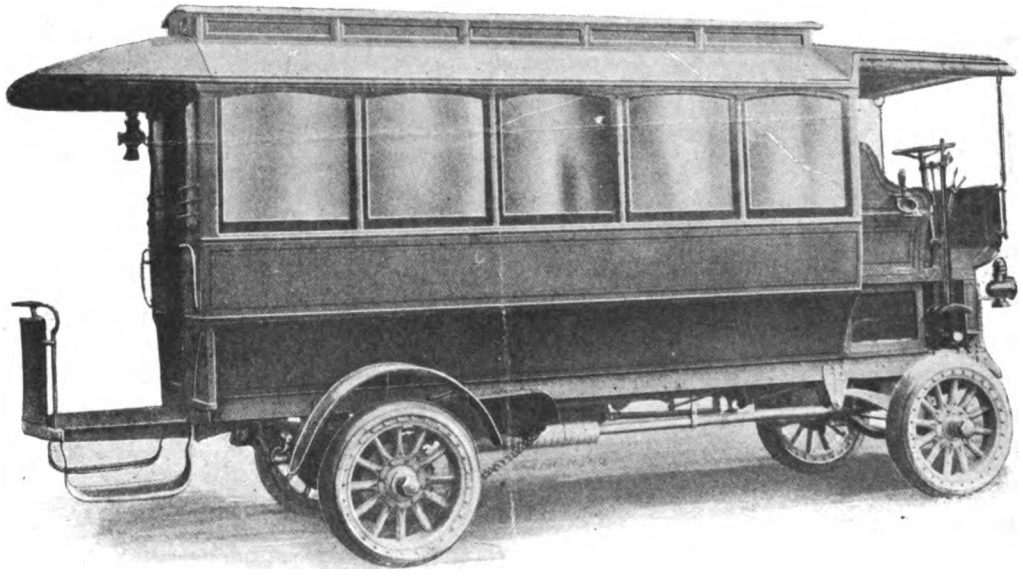
Once in two weeks the Paris motor buses are "shedded" for two days in order to permit thorough overhauling of the vehicles.

MACHINES FOR CARRYING POULTRY

TWO large poultry dealing firms in the state of Indiana are making preparations to abandon draft animal transportation on account of its slowness and excessive cost. These are the Jacques Packing Company and the Hogan Poultry Company.

Both of these concerns are well represented throughout the state, having branches at Lafayette, Attica, Lebanon, Goodland, Kentland and other points. They want motor trucks to haul their merchandise to and from shipping points. The perishable character of the loads, and the consequent necessity for transporting them as quickly as possible, makes the use of machines highly desirable. In addition there is money to be saved in employing fewer wagon units and less drivers.

When London railroads found that motor bus was encroaching on their suburban traffic they did not profess that they do not care for the traffic, nor vow that because they could not make up the loss on other traffic they must raise suburban rates. On the contrary, they showed that they wanted the business at even lower rates by reducing commutation tickets. They not only reduced rates on nearby traffic, but extended the commutation zone. They are now selling season tickets to Brighton at a half-cent-a-mile rate, which, though of course not conclusive, is interesting in connection with the claim made here that a 2-cent-a-mile rate is confiscatory.



Type of Bus to be Used on the Jamaica Estates in Long Island

THIS picture shows one of the 22 passenger buses to be used in conveying property owners on the Jamaica Estates to and from the Long Island railway depot. The machine, which was made by the Mack Bros. Motor Car Company, of Allentown, Pa., is fitted with a four cylinder engine having 5½ inch bore and 6 inch stroke. A double system of ignition is employed—high tension magneto and four-cylinder vibrating coil with roller contact commutator. The transmission, giving three forward speeds and reverse, is of the individual clutch type, all gears being automatically cut out when running on third speed. Chains of 1½ inch pitch are employed in driving. The fuel tank has capacity for 22 gallons of gasoline. Brakes are of the internal expanding type; one emergency brake on each rear hub and two service brakes on countershaft. The front wheels are fitted with 6 inch tires; the rear wheels with 4 inch twins. The wheel base is 168 inches. The tread is 72 inches. The normal speed of the vehicle is 12 miles per hour. At this rate of speed the engine makes 800 revolutions per minute. When desired the vehicle can be speeded to 20 miles per hour on fairly level and hard roads. It will ascend grades of 20 per cent on the low gear at a speed of 3 miles an hour. Grades of 6 per cent can be climbed on the high gear with full load. Each vehicle has a range of approximately 80 miles on good roads with one filling of the gasoline tank.

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Causes of Spring Troubles

Paper Read by Spring Manufacturer Before the Society of Automobile Engineers

CERTAINLY the quality and probably the design of springs would be much improved if the producers of motor vehicles were to work in closer harmony with those who make a specialty of matters pertaining to suspension.

The bulk of spring troubles are occasioned by excessive deflection which produces stresses in the material beyond its endurance. As spring makers practically work to specifications supplied by their manufacturing customers it is the latter who should be held to account when springs fail in service. How it happens that the blame for faulty spring construction is not placed where it properly belongs will presently be shown.

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The laws which govern spring construction, though well known, are often slighted. As a result of this neglect spring makers not infrequently receive specifications for work which it is impossible to comply with. This would seem to indicate that there are many vehicle designers who pay very little attention to the actual conditions of service in which springs are to be used. When springs break their makers are held responsible and a replacement is demanded. Unless unnecessarily rough usage can be proved the claim is allowed. Though such transactions apparently constitute acknowledgment of error on the part of the spring maker, actually they have a far different meaning. Nine-tenths of the time the spring maker is manufacturing his product in entire ignorance of the work in which it is to be employed. While he probably can make a tolerably good guess concerning the easiest work it will be called upon to endure, he is not permitted to know how severely it may be taxed. He reluctantly works to orders. This is all the more singular considering his highly specialized knowledge, his experience in design, his judgment in the selection of suitable materials, and his large fund of information relating to process work and heat treatment. The truth is, the spring maker is in a false position, his natural trade allies, either through ignorance or prejudice, or both, conspiring to keep his talents hidden.

* * *

Suffering in reputation, and blamed for faults he does not willingly commit, the spring maker has no choice but to defend himself. As a measure of relief he proposes the education of the vehicle designer in matters which nearly concern them both. He urges the study of the functions of springs, their proper deflection, materials and dimensions. The first shot in this campaign was fired at a recent meeting of the Society of Automobile Engineers by J. S. Rumney, of Detroit, whose interesting remarks are herewith presented:

The cause of all trouble with springs, aside from poor material and workmanship, is found in an excessive deflection, *i. e.*, a deflection which produces stresses in the material beyond its endurance. The deflection of a given size of steel is limited to an amount corresponding to the strain the material is able to endure without rupture, and consequently if this is exceeded failures will result. When, therefore, the deflection is forgotten, or not considered in the calculations, springs are generally produced which prove anything but serviceable, and must be frequently renewed at great cost and inconvenience.

Deflection is, therefore, the paramount issue in the construction of springs. There are, however, three kinds of deflections, which may be termed desirable deflection, permissible deflection and possible deflection. The desirable deflection is the amount a spring should be able to deflect in order to avoid shocks and produce good riding over a rough road, and must be provided for in the construction of motor cars so that a sufficient amount of material of proper dimensions may be used. The permissible deflection is the amount a spring may be deflected repeatedly without breaking, or without changes in its original shape. The ability of a spring to deflect within safe limits depends entirely upon the proportions of the plates, which will be explained further on. The possible deflection is the total distance a spring may have the opportunity to deflect if allowed to do so and which is generally provided for in the construction of springs. In full elliptical springs the possible deflection is the distance between the centers when free. The distance can be so proportioned to the dimensions of plates that when the centers meet the material has not been overstrained. In half or semi-elliptical springs the distance may be much greater than the permissible deflection, and if the springs are permitted to deflect the entire distance it is apt to break or take a permanent set, either of which is equally objectionable. Construction should, therefore, be so made that the possible deflection does not exceed the permissible deflection, and if this is impracticable in the ordinary construction of frames, etc., some means should be introduced which will accomplish the same results.

The object of this paper is, therefore, to call attention to the methods which should be followed in the calculations of elliptical and semi-elliptical springs so as to guard against an excessive deflection, which is the principal cause of broken springs, and thus bring about a better understanding between the makers and users of such springs. To make the subject clear to those who may not be perfectly familiar with the laws governing strains in materials, some elementary explanations will be used, which it is hoped will be excused by those to whom they may be unnecessary.

It is well known that if a piece of steel or other material in the shape of a bar is supported upon its two ends, and a load is applied in the middle of the bar, the material will be subjected to strains, and if the load is great enough the strains will go beyond the endurance of the material and the piece will break, or its original shape will be changed.

It is also well known that all materials will deflect more or less when supporting a load in this or similar ways; and, further, that the amount a given piece will deflect depends entirely upon the magnitude of the load or its momentum, and that, therefore, the greater the load the greater is the deflection. It is equally well known, but generally lost sight of, especially in spring construction, that the strain in the material increases directly as the load, and consequently as the deflection. Therefore the strain in the material is twice as great if deflected two inches as it is if deflected one inch only, and three times as great if deflected three inches; from which may be seen that if there is no limit to the deflection the material will be over-strained. From this it naturally follows that while springs are made use of for the purpose of obtaining deflection, and to gradually check and bring to rest a suddenly applied force, it is evident that the deflection must be limited within certain boundaries.

The extent to which a given spring may be deflected (the permissible deflection) depends upon several things, among which may be mentioned:

First.—The nature of the material.

Second.—The length and proportionate arch.

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Third.—The width and thickness of the plates.

Of these the first mentioned is perhaps the most important, for without proper material the most careful calculations will not produce the desired results. The importance of the other two items is found by calculations based on formula and experience. These formulas show that the deflection is governed entirely by the length and thickness of the plates, and that the relative proportions between these two dimensions cannot be changed without a change in the deflection. A plate of a fixed length and thickness, or a spring of fixed length and thickness, no matter how wide the plate may be or how many plates the spring may be composed of, has a well-defined (permissible) deflection, which cannot be exceeded without straining the material. The relations between the deflection, thickness and length of plates must, therefore, be maintained within figures corresponding to the strength of the material, in order that the best results may be obtained. These relations are often overlooked in the construction of springs.

Springs are used on account of their ability to absorb through sudden deflection increases of loads and to regain their original shape when the excess load has been removed, thus avoiding violent shocks. The greater the distance through which a spring can deflect the longer is the time in which the load is fully applied, and consequently the less severe is the shock. The more sensitive they are to any variation in the load the easier the vehicle will ride. The nearer the spring is loaded to the elastic limit of the material, the slower, longer, easier and more uniform are the vibrations.

This statement may not be understood, but may be verified in a simple manner by placing a piece of wood or other material on two supports and loading it in the middle with a suitable weight.

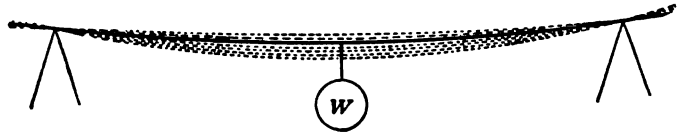

FIG. 1.—Showing quick vibratory action under light load.

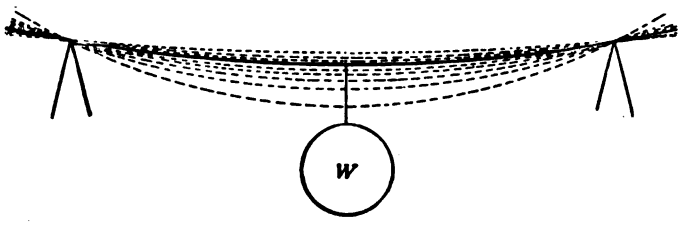

FIG. 2.—Showing slow vibratory movement under increased load.

If the relation of the weight to the material and section of the piece is such that the stress in the material will be comparatively low, the action of the piece, if set in motion, will be in the nature of a number of small, very quick vibrations, as shown in Fig. 1. The full line is intended to represent the position at rest, and the dotted lines the number and magnitude of the vibrations. If the load is increased so as to approach nearer to the elastic limit, the vibrations will be as shown in Fig. 2—a few long, slow movements. There can hardly be any question as to which one of the two methods should be followed in order to produce smooth riding.

When deciding, however, as to how near the stress under the static load may approach the elastic limit, it must be borne in mind that if it is too near the limit very little additional deflection can be obtained before the elastic limit is reached and the usefulness of the springs is destroyed. Practical tests have demonstrated, however, that a strain under a static load of 60 per cent of the ultimate resistance of the material is permissible and will leave sufficient margin, in the majority of the cases, for the absorption of ordinary shocks.

We have tried to discover the reasons why springs did break, and looking into the matter in various ways we came to the conclusion that there were, as it may be called, no safety valves placed upon the springs, that is, at least upon the semi-elliptical springs. The full-elliptical springs have a safety valve, and if properly designed the springs cannot be overstrained, for when the centers meet the strain is at its limit, but with the semi-ellliptical springs the situation is different; there is nothing to prevent the springs being deflected beyond their elastic limit.

The method of calculating springs has been laid down by Reuleaux in his formulae, and if they are properly understood there is no reason at all why manufacturers should not make proper springs. But the formulae are not understood, and as a last resort vehicle makers generally specify the weights that the springs are to carry and leave the rest to the spring makers, and allow them to design any spring that is suitable to carry the static load and which they think they can guarantee. Many manufacturers do not look into the conditions under which the springs have to work; they look on the load and the material, not on the deflection at all, and springs are placed in service in positions where they are not suitable. * * * The breakage of a spring is due to an excess of deflection; that is to say, if the road is rough and with fast speed, the result is that either springs take a permanent set or the plates will break. The deflection is determined entirely by the length of the springs and the thickness of the material. Any spring that is properly designed should last until the material has become fatigued through constant use.

The question as to what should be a proper deflection for springs has been argued in many ways, but I think it will be agreed that the greater the deflection can be made the better the vehicle will ride, and after it has been determined what the deflection should be the remaining requirements may be readily calculated. The riding of the vehicle depends largely upon how high the strain in the material is allowed to be under the static load. The nearer the strain comes to the elastic limit the easier the springs will act; the farther away from the elastic limit, the rougher will be the riding.

The best spring-makers, using the very best steel, cannot make a satisfactory spring unless the deflection is limited within the bounds of the elastic limit of the material. Next to the steel, or perhaps more than the steel, the construction of the spring is, in most cases, of the most importance. Also of prime importance are a properly standardized uniform heat treatment, special composition, high tensile strength steel, and intelligent design, associated with modern refined heat treatment. These are necessary to produce springs such as are required by automobile manufacturers who desire to maintain a good reputation.

The police authorities of London have informed the motor omnibus companies that sectional block tires are not considered suitable for heavy public service machines, and that when those now in use are worn out they are not to be replaced by tires of similar construction. The unequal wear of the blocks is assigned as a reason for this decision.

A contract has been closed between the Standard Oil Co. and the Findlay Auto Transit Co., whereby the latter will convey the workmen on the pipe lines between Cygnet and Lima to and from their work. A motor bus leaves the courthouse at Findlay, O., every morning at 6 a. m., taking the workmen out, and bringing them back at the same hour each evening.

An appropriation will soon be asked for the purchase of a motor patrol wagon for the Indianapolis police department.

Policemen who regulate traffic on the roads leading to Atlantic City are to be mounted on motor bicycles.

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Railway Cab Service

Revival of Rumor That the Pennsylvania Company is to Employ Motor Vehicles

AGAIN the rumor is current that the Pennsylvania Railway Company has decided to use motor cabs instead of horse drawn hansoms and coupes at all of its principal stations. Doubtless the substitution will soon occur, but as the story of its imminence has frequently been circulated during the past three years patrons of the road will prefer to wait for visible evidences of the company's good intention before indulging further expectations.

* * *

It is no secret that the chief executives of the Pennsylvania system are dissatisfied with their present cab and carriage service. They freely admit that it is expensive, out of date, and incapable of further development. Its abandonment, which is inevitable, will be greatly hastened by the competition of companies organized, and being organized, to operate nothing but motor cabs.

Experience indicates to all railroad men that in the scheme of rapid transit horses can render no service, however humble, which may not be better and more profitably performed by machines. The Pennsylvania company, participating in this feeling, doubtless only continues its horse cab service because of the difficulty which accompanies all efforts to obtain motor equipment in this country. This hindrance to progress, however, will soon be removed. American made motor cabs of all kinds are in sight. When they are produced in quantities, as they shortly will be, horse drawn cabs will practically disappear from all large cities, for the latter will be unable to compete with the newer and more economical vehicles.

In a measure the operators of the Pennsylvania cab service can afford to wait longer than other cab proprietors before making use of motor vehicles. The patronage of their service is something of a monopoly, cabs of competitors in many instances being barred from the enclosures occupied by the Pennsylvania's vehicles. This protection will probably be effective so long as the bulk of cabs put at the service of the traveling public are drawn by horses. It will vanish with the general introduction of the motor cab.

* * *

The substitution of motor cabs for horse drawn cabs is a matter which has long occupied the attention of the Pennsylvania management. As far back as four years it was realized that a change in the nature of the service was needed in order to keep pace with modern travel improvement. Estimates of the cost of installing electric vehicles were obtained, but as the showing of electric cab companies at and prior to that period was not very alluring, and motor vehicle constructors were too busy with other work to seriously consider new designs, the matter was permitted to drop. Soon afterward the company took counsel with makers who it was anticipated might be in position to produce gasoline cabs. The development of the gasoline cab, however, was not very far advanced at that time, and here again the company was compelled to sidetrack its undertaking.

In this situation it occurred to the company that it might make cabs in its big shops at Altoona. No official announcement of such intention has yet been made. This, however, would not be sufficient to discredit the rumor that it is about to do so. It is habit with the company to conceal all of its important designs until they are ready for execution. It will be recalled that such a policy enabled it to keep the public in ignorance of its intention to use electric baggage trucks until they were actually put in service in its Philadelphia depot.

In Chicago the Pennsylvania's minor transportation service is farmed out to the Parmelee Transfer Company, which is beginning to feel the competition of independent cab owners, now that the latter have decided to turn over a new leaf and make reasonable charge for the use of their vehicles. The Parmelee company is on the eve of employing motor cabs, motor buses and motor wagons. In New York the Pennsylvania cab service is operated by the company itself. It is considerably cheaper than the service of other horse cab companies, but its rates are much higher than those announced by the two gasoline motor cab companies recently formed to operate in New York.

The United Motor Cab Company of London, each of whose gasoline vehicles are earning $11 a day, which is $2.40 higher than estimated in the company's prospectus, has doubled its capital stock, the issue now being $2,500,000.

The General Motor Cab Company of London now has 325 taximeter vehicles in service with average of individual earnings amounting to $11.38 daily.

Efforts are being made to establish a motor bus line between Flint and Fenton, Mich. The two towns are 16 miles apart. If the service is inaugurated five trips daily will be made.

It has been decided to operate a motor bus line between Seymour and Brownstown, Ind. A 20 hp. machine, carrying 12 passengers and making four round trips each day, will be employed.

The owners of a farm situated between Burlington and Mount Holly, Pa., have recently found it necessary to employ a motor truck in hauling potatoes and other produce to market.

An ordinance is to be introduced into the Buffalo council which aims at taxing all public service motor vehicles at the rate of $100 a year.

In the course of a recent census of London's motor buses is was found that 360 of the machines were made in Great Britain, while 538 were of foreign construction.

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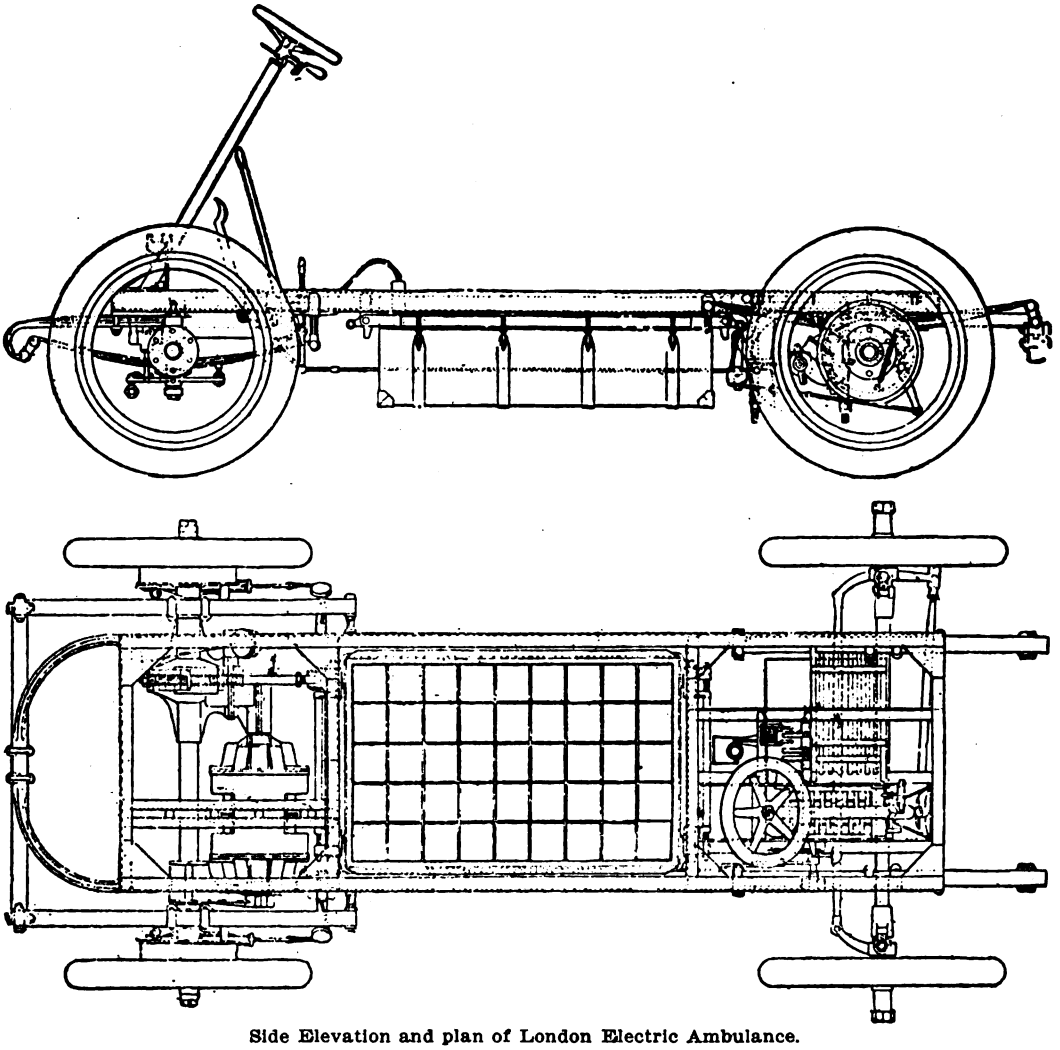

Side Elevation and plan of London Electric Ambulance.

Municipal Motor Ambulances

Electric Vehicles are now Being Intalled in the City of London; Description of the Service

NO city in the world has greater need for a modern ambulance system than London, where, until last April, nothing but hand apparatus was used by the municipal authorities. To quote a contemporary: "It is quite possible for a dying man to lie in the street half an hour before an ambulance could be called in which to take him to the hospital. More often than otherwise an injured person is actually finished off by being taken to a hospital, for the police often decline, under mistaken ideas of humanity, to wait for the ambulance, but double up the injured person somehow into a hansom cab or growler and jolt him so badly that death subsequently ensues. The greatest and richest city in the world has been noted for its antiquated ambulance while famed for its multiplicity of hospitals."

Many attempts have been made to relieve the city of the shame of such a state of affairs, but all were unsuccessful until the city of London proper authorized the purchase of a few electric ambulances, one of which was recently commissioned in advance of two more which are now being constructed. Last year the London county council—it should be borne in mind that London is governed by two corporate bodies—applied for parliamentary sanction for the operation of twenty-or more electric ambulances. Details of the plan under which they were to operate were so imperfectly worked out, however, that permission was refused. Before deciding upon the character of its machines the city of London considered the employment of horse drawn vehicles and motor vehicles of every kind, eventually concluding that the ability of the electric to get into action in a speedy manner, and its reliability, made it superior to all vehicles for this purpose.

Fifty-two police ambulance call boxes are now stationed throughout the city, each connected to an exchange which has been equipped at the city police headquarters. This exchange is connected by telephone with three ambulance stations, only one of which has as yet been supplied with a motor vehicle. The comparatively small area of the city proper accounts for the fact that no more call boxes and ambulance stations are required. Every policeman is supplied with a key to the call boxes.

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It is the intention to supply each station with one vehicle at first. If the service proves too arduous, two or three machines will be supplied to each station. The battery of these vehicles will consist of 45 cells, each battery having a capacity of 135 ampere hours, which is sufficient to run the machine for 40 miles. It is expected that each of the three vehicles to be first commissioned will not find it necessary to cover more than 4,000 miles per year apiece. The top speed of the vehicles is 15 miles per hour. The weight of the chassis, exclusive of battery, is 950 pounds; with battery, 1,950 pounds. The motor is rated at 8 hp. and is capable of sustaining an overload of 100 per cent.

Transmission of power is through a double train of double helical gears to a bevel balance gear on the rear axle. The rear axle is of the divided type, the two halves carrying the driving wheels revolving in an external tube, also halved, and forming the supporting axle. This construction permits easy removal of wheels. Wheel base is 7½ feet; track 4½ feet. The battery is hung from the center of the frame. The controller is located immediately below the steering handle. An index plate, mounted below the controller handle, shows the positions for the speeds. Two electric brakes are supplemented by a double acting expansion brake fitted to the rear wheel hubs. The expansion brake is operated by a hand lever. The electric current is broken before this brake is applied. When the brake lever is applied the vehicle runs free; on releasing it the motor continues to drive.

Policemen are being taught to drive these vehicles. It is the intention to train a large number of men at each ambulance station, so that when a call is received an officer on duty can drive the machine to the scene of accident.

STEEL COVERED HIGHWAYS

MOTOR road transport would be wonderfully stimulated if highways suitable for the heaviest class of traffic were provided. The tendency of the age is to construct roads which are only suited for the needs of the hour, for light loads and draft animal traffic. This is an obvious error considering the rapidity with which motor road transportation is spreading. But it is reassuring to reflect that the duly constituted authorities, to whom is entrusted the duty of constructing and maintaining public highways, have taken cognizance of it and upon every convenient occasion endeavor to make apparent the penalties of such a short-sighted policy.

Instead of building roads for the moderate travel of the present period it occurs to the road engineers of the world at large that it would be saner and more economical, now and in the future, to construct for such traffic as might naturally be anticipated when the bulk of haulage is accomplished by motor. The whole of the road need not be made suitable for heavy traffic, but it is evident that strips of it should be capable of sustaining great loads. This was the opinion which prevailed at a recent meeting of the Association of Municipal and County Engineers, at which the following sound sentiments were expressed by one of the ablest members of the body:

The increasing use of heavy vehicles for the conveyance of goods along the ordinary roads is in many districts causing road engineers a good deal of anxiety on account of the damage done to their road surfaces, and it appears not unlikely that the provision of satisfactory road surfaces for the conveyance of merchandise may presently form a very important portion of the duties of the municipal and county engineer. Where sufficient traffic of a heavy character is continuously passing over a line of road to pay for the construction of a street surface, it is hardly likely that a stone surface will be found seriously to compete with it, but there will still remain many roads on which the traffic will be so mixed in character that a surface in which stone is the principal ingredient will probably meet all requirements.

If a surface is provided suitable for all classes of existing vehicles, the day for the conveyance of merchandise in large quantities over public roads will probably have arrived. I may say that, as the result of my study of special requirements for traffic purposes in connection with main roads, I have for many years been of opinion that ultimately it will be necessary in special cases to grapple with the question of cheap transfer of goods on public roads, and when this problem is faced it will in my opinion be solved by the construction of wide thoroughfares having a portion of the surface laid in steel, in such a form and so arranged as to provide for the passage of motor trains and fast-traveling vehicles of any type. This is, of course, no new suggestion, as we have in Alfred Holt a distinguished exponent of this theory, who has for many years consistently and persistently advocated the use of a "plateway" for goods traffic between the seaboard and the manufacturing districts.

With regard to road construction and the materials used for roads, we are told by the non-technical press that the road engineers of the present time know practically nothing about the requirements of road construction necessitated by the advent of the motorcar. We are told that roads should be constructed entirely on the lines laid down by Macadam and Telford, and it cannot be doubted that roads so constructed have fairly met the conditions for moderate traffic up to the present time. It is, however, well known that the macadam road is entirely unsuitable for roads carrying really heavy traffic, and my experience in providing and maintaining street surfaces to carry the heaviest traffic which I know to exist anywhere—that along the line of docks in the city of Liverpool, where the average two-horse load on four wheels amounts to 7 to 10 tons, and where a common load behind a tracton engine, I am assured by traction engine users themselves, may be taken as 35 tons, and where exceptional loads up to 100 tons on four wheels may at any time be expected—leads me to think that the satisfactory and really economical surface for even light traffic is quite as liktly to be found where the surface is so arranged as to entirely prevent any rolling or grinding action or motion of any sort among the materials forming it, as in the macadam type of construction, in which the surface materials are so arranged as to be liable to motion under any passing load.

Our experience with medium traffic shows that the annual cost of maintenance of a street is practically nil over a life at present extending up to twenty-five years, and though I cannot at present point to any form of such construction which is entirely suitable to replace the ordinary macadam road, I venture to think that time and thought expended on the improved application of those prniciples to meet the requirements of lighter traffic roads will ultimately result in satisfactory solutions of the problem.

The chief of the fire department of Thompsonville, Conn., has recommended the purchase of motor fire apparatus, and in consequence the sum of $3,000 has been appropriated from public funds to make a beginning in replacing the present horse drawn equipment.

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Correspondence

The editor invites correspondence on all subjects connected with the use or design of power wagons. No responsibility, however, is accepted for the views expressed by correspondents. No letters from firms engaged in any branch of the power wagon industry, which may be regarded as mere advertisements of their products, will be published. However, as many of the most practical suggestions come from those engaged in the industry, their communications upon matters of general interest will be especially welcome.

Foreign Gasoline Cabs in New York

To the Editor—Being first to take the field is not nearly so important as being well prepared to sustain a campaign. The New York Motor Cab Company, with its equipment of foreign made vehicles and its support of foreign capital, is sure to command a large volume of patronage in the beginning. But will it be able to hold its own against rival companies now being organized with American capital to use the product of American factories? I don't think so. Sentiment is too easily converted into prejudice.

I predict lively times in New York when all the motor cab companies now being hatched out are ready for competition, and in the struggle for patronage which is bound to ensue I venture to think that Anglo-Gallic interests will not fare best. Provided the behavior of American and foreign built vehicles is precisely alike—and the difference can't be greater than that which distinguishes tweedledee from tweedledum—it seems safe to assume New Yorkers will prefer to support home enterprise against that which is maintained for the profit of foreigners.

I notice that in London the British-built motor buses are rapidly coming to the front, now representing about 40 per cent of the total in commission. When operations first began the continental machines had the call. In the near future the bulk of these heavy public service vehicles will be of domestic origin. French motor cabs in New York, taxed with a duty of 45 per cent for importation, do not seem likely to meet with much more favor than European motor buses in London landed duty free.

It is amusing to read what the promoters of the New York Motor Cab Company have to say concerning vehicle earnings. While the novelty lasts a few of the machines may earn $24 a day gross. In a year from date, however, the executives of the company can count themselves lucky if the average of daily earnings is one-third of that sum. Even with this diminished income, it is still possible to show a good profit on operations if the service is not extravagantly conducted and competition does not, as in the case of the London motor bus companies, lead to a ruinous war of rates. J. S. DALRYMPLE.

New York City.

* * *

Passenger Automobiles on Rails

To the Editor—If automobile builders would construct machines to be used on rails they would show an appreciation of a general public desire. Such vehicles would be very popular in small towns and should prove much more economical than steam or electric cars.

Although there has been some discussion concerning the establishment of a motor bus line between Bryan and the neighboring college, nothing has come of it. Except in dry weather, when the roads are in good condition, a motor bus would have difficulty in making the journey. J. P. MALONEY.

Bryan, Texas

* * *

Motor Bus Line Wanted

To the Editor—The trustees of Hanover College would be very glad if some one would establish a motor bus line between Madison and Hanover. Madison has a population of 10,000. Hanover has a population of about 1,000. The college has about 135 students. The distance between the two points is six miles, a fine turnpike road connecting them. Doubtless the contract for carrying the mail could be secured by those who would undertake to operate the line. Six or seven round trips could be made each day. There is no railroad connecting the two points. The merchants of Madison would be benefited by the operation of a system of transportation which would divert trade from mail order houses to their stores. HOWARD S. MOFFET.

Madison, Ind.

Recent tests of the economy of the Renard road train show that a train composed of a motor vehicle and three trailers can be worked at a cost of 3 cents a ton mile over a route measuring 6 1-2 miles, making six round trips daily and carrying about 45 tons. In this calculation 20 per cent is allowed for depreciation of the whole train. When a train capable of hauling 15 1-2 tons is used, the cost is found to be 2.4 cents per ton mile. The average speed maintained during the tests was 8.6 miles per hour. The fuel consumption worked out at 2.6 gallons an hour.

Of the 65,279 square feet of floor space available for exhibition purposes at the Grand Central Palace automobile show, to be held in New York from October 24 to 31, only 4644 has been apportioned to makers of industrial motor vehicles.

The police department at Baltimore was recently supplied with an electric patrol wagon.

One of London's motor bus companies fines the conductor if a vehicle, after having come to an involuntary stop, is moved before an inspector from one of the workshops can make an examination of it.

The police in a German city have been called upon to decide whether a brewers' motor truck, weighing, loaded, nine and three-quarter tons, is entitled to the use of the streets. The object of the inquiry is to ascertain if the road surfaces will support traffic as heavy as that indicated.

Business men of Girard, Georgia, who wish to extend commercial relations with surrounding towns, are endeavoring to establish a motor freight and passenger line connecting Girard, Telfairville, Shell Bluff, Waynesboro, Alexander and Sardis. If the project is successful machines will cover a circuit of 50 miles in about four hours.

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Future of the Cab

A Few Reasons Why Machines Are Sure to Replace Existing Horse Drawn Vehicles

MOTOR cabs are greatly superior to horse drawn cabs in every particular which could reasonably be expected to appeal to the interest of either investors or passengers. A hasty study of their relative values shows that the machine is easily capable of covering 100 miles in eight or ten hours, earning all the time, while under the most favorable conditions a horse drawn vehicle cannot cover more than 25 miles daily. This comparison plainly indicates which form of transportation is best fitted to be perpetuated. Neither as a revenue producer, nor as a public service instrument does it seem worth while to continue the service of the horse cab. It has had its day, like the horse drawn street car, the road coach and other antiquities of like character.

* * *

The motor cab is not merely heir to all the passenger business of the horse drawn cab, but it is certain to create a traffic of its own. In which respect nobody sees its future in this country so clearly as E. R. Thomas, who has undertaken to produce motor cabs in quantity for the American market at his factory in Buffalo. Mr. Thomas thus sums up the situation:

The motor cab may produce revenue by operating regularly between points twenty-five miles or more distant, a service which it would be impossible for the horse to perform. It can be operated in all kinds of weather. It occupies less room than a horse cab, and from a sanitary point of view is highly desirable. Physicians have long recognized that the elimination of the horse from the streets of our cities would, by the removal of so much filth as it makes possible, contribute greatly to the public health.

Foreign cities have the cheapest horse cab fares in the world. In some localities a fare of twenty-one cents for the first mile and eleven cents for each succeeding mile, for one or two persons, is in force and on the basis of such rates annual dividends are declared from earnings after deducting all expenses. Rates slightly varying from these have been adopted by the livery companies now using motor cabs seating three passengers, including the driver, with accommodation for one extra person if desired. This business has grown to such proportions in a short time that it is believed the horse-drawn vehicles carrying passengers will be entirely eliminated in a few years.

One motor cab able to do three times more work and three times quicker than the horse cab, with increased carrying capacity, means more than three times the earning power of the horse cab, with little if any increase in operating expenses. London, Berlin, Paris, and other continental cities are adopting motor cab service as quickly as it can be installed. It is the experience abroad that the public will not use the horse cabs for street, pleasure or shopping service when motor cabs are available.

This new era in traffic conditions, created by the departure from old methods, has encouraged foreign capital to build motor cabs and operate them to meet popular demand. These motor cabs, in addition to increasing the volume of livery business, have opened up an entirely new patronage, as the public is using them for short tours in the country, as well as regular communication between suburban towns, a business heretofore accommodated by steam railway and trolley lines. With conditions far more favorable in the United States, the successful and profitable operation of motor cabs in our large cities is confidently expected to stimulate a new field of commercial activity which will be unlimited in its possibilities.

When it was first announced that the Thomas company would produce a motor cab the details of its construction were withheld. Now that production is well under way the most complete information is available concerning the design. The cab is small in size and light in weight, equipped with landaulet, limousine, or cabriolet body. It is designed for town, suburban and, to some extent, touring service. The top of the landaulet may be lowered and the cab completely opened. It is upholstered in leather or cloth, and painted red, with some departure in decorations to make the cab easily distinguishable in the streets. It is flexible and quiet in operating, weighing about 1,600 pounds. The center of gravity is quiet low

The vehicle is geared for maximum speed of about twenty-five miles an hour, with reserve power for hills and bad weather conditions. It represents the result of critical investigation of the motor cab problem in all its bearings in Europe. It is an original design, and in many respects the most simple and artistic yet produced. It is designed especially for economical operation and maintenance, lightness and strength having been combined in a degree heretofore unapproached. Every part is exceedingly simple and accessible. The use of chrome and nickel steel is abundant. The crank shafts, cam shafts, transmissions, and wheel bearings, are all of the annular ball bearing type. The rear axle includes the transmission, so that in case of needed repairs the whole may be replaced with another within a few minutes. All other parts are easily and quickly replaced, so that the cab may be kept in continuous operation, which is vitally important to the work it will be called upon to do.

Other features of the Thomas cab are as follows: engine, four cylinder, water cooled, developing 16-22 hp.; wheel base, 100 inches; tread, 54 inches; drive, propeller shaft, floating type of rear axle; clearance, 10 inches; engine valves, all on one side and mechanically operated, valve seats water jacketed; three point suspension; exhaust pipe water jacketed; carburetor, water and air cooled and cast integral with crank case; magneto ignition; force feed lubrication; control regulated by throttle and foot accelerator; change gear located on rear axle, chrome nickel sliding gears; speeds, three forward and reverse, selective type; gear ratio, 3½ to 1; clutch, leather cone type; springs, front semi-elliptic, rear full elliptic; radiator, vertical tube, back of axle; circulation, natural thermo-syphon; fan, cast in fly wheel of engine; brakes, four in rear wheels; steering gear, screw type, adjustible; tires, front and rear, 32 x 4; fuel tank capacity, 10 gallons; water capacity, 8 gallons; oil capacity, one gallon.

One result of London's motor bus service is that steam railway trains which formerly accommodated passengers within ten miles of the metropolis have lost heavily in patronage.

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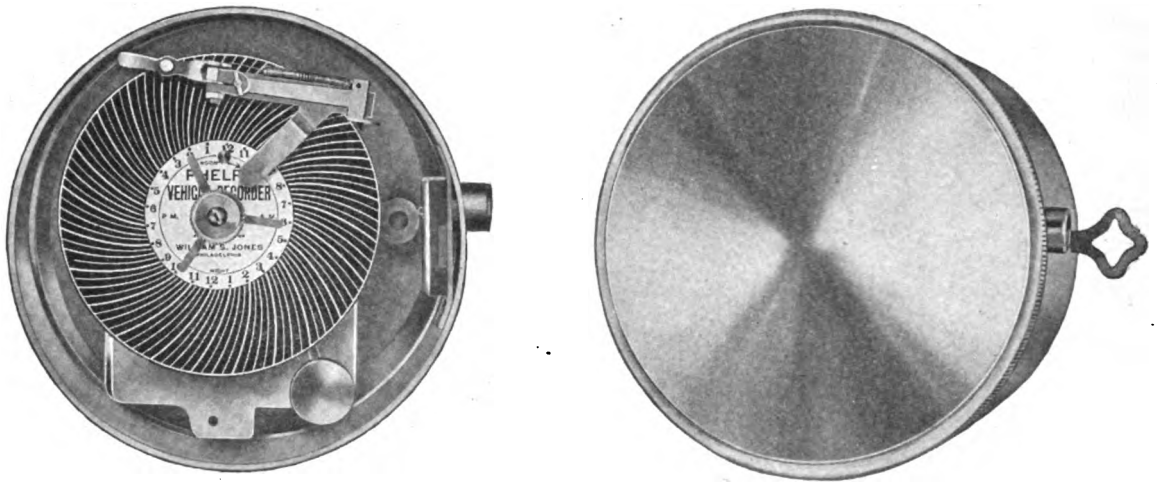

Interior and Exterior of The Phelps Vehicle Recorder.

Tracing Vehicle Movements

Importance of a Device Which Automatically Furnishes a Record of Road Behavior

OWNERS of industrial motor vehicles have for a long time been expecting the invention of a recording instrument which would impart reliable information concerning the behavior of machines when on the road and out of executive control They have particularly wished for a device which would automatically register the number and duration of stops in the course of a day's work Lacking such a record it is practically impossible to know how much time is usefully or uselessly consumed, whether good judgment is being exercised by drivers, or if the equipment is being used in a manner befitting its capacity

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The science of operating power wagons consists of perfect administrative control If the losses are to be kept down to the minimum sound practices in the stable must be accompanied by precision of work on the road. Idle hours must be satisfactorily accounted for or eliminated altogether. But the time element, though capable of nice control in the stable, is nearly always ignored when machines are operating under load. Drivers are then in command of the situation, and are at liberty to make such reports as they please to superiors concerning road performances or the causes of delay. The result of this unnecessarily generous policy is that the vehicle is frequently blamed for the faults of operatives.

Every commercial motor vehicle has a certain potential usefulness. It may be developed, or not, according as the driver is attentive or inattentive to his duties. If he is permitted to run the machine at will it is quite likely that its utility will never reach the mark fixed by its designers. If, on the other hand, it is operated to agree with a schedule of performance prepared in the stable it will, if well cared for, yield work results as anticipated.

Being in position to trace the movements of a motor vehicle without accompanying it on the road, enables the stable foreman to make intelligent decision in many matters which bear upon the question of good administration. If, for example, he perceives from a number of daily reports that machines are being underworked, he can insist upon drivers making better time with the alternative of discharge. The recording instrument, being his deputy on the vehicle, enables him to ascertain which are the weak points in the road service. The information it supplies, together with observations taken during the course of an occasional inspection of the physical character of the routes, will often lead to improvements which otherwise would not even be suggested If the speed of the vehicle is also under control he can practically chart the work of a wagon in the hands of an intelligent driver, know where it will be at a certain time, and when it can be calculated to reach its destination or the stable from whence it issued. For all useful purposes his control of the service is as thorough as that of a train dispatcher.

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Although many attempts have been made to produce a recording instrument of the kind required by commercial motor vehicle owners, such efforts have not been particularly fruitful. Very few have taken pains to ascertain the precise nature of the work to be accomplished by the device. The designers of the Phelps recorder stand foremost among this little group. The Phelps instrument seems to meet the main requirements of commercial motor vehicle service. It is not a speed or mileage measuring instrument. It is complementary to both of these devices. It is intended solely for the use of vehicle owners who desire definite information concerning the road behavior of their rolling stock. It furnishes accurate and continuous daily and weekly record of vehicle performances, such records appearing on paper dials. It may be mounted in any convenient location in the body or top of the vehicle, away from all possible contact with merchandise or passengers. The clock movements are constructed to stand rough service and accurately indicate time.

The functions of the Phelps instrument are as follows: to record the number of stoppages; the time at which the vehicle starts after such stops; the elapsed time

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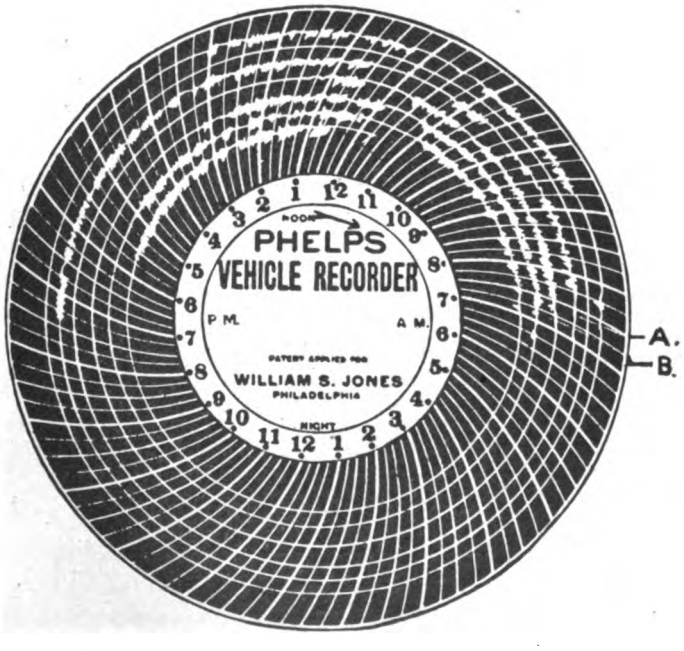
of every stop; the elapsed time between every start and stop; the time of day at which the vehicle goes into service, and the time at which it returns to the stable It indictates whether or not stops were made at appointed hours and were of proper duration, thereby preventing waste of time at unseasonable hours. Of course it is apparent that in supplying these records the device practically prevents drivers from over-speeding in order to make up for the time lost in loitering on the road.

The mechanism of the instrument is under lock and key. It cannot be tampered with, disconnected, or otherwise put out of service. Of still more importance is the fact that it cannot be made to supply false records. The dial records are printed on sensitized paper, the records showing in white. These records determine the working capacity of the vehicles and thus avoid overworking or underworking. The mechanism is contained in an aluminum case. The instrument is being marketed by William S. Jones, of Philadelphia.

* * *

The heart of the device is a twelve day, eleven jeweled, fully adjusted clock movement, able to withstand all temperatures and positions, and fully isochronised. This clock movement drives a device, using a snail movement, to locate the recording timer point on the different days of the week. The dial table, holding the weekly sensitized dial, revolves one turn in twenty-four hours, while the snail revolves but once in seven days. One seventh turn of the snail raises up the recorder or scratcher point one seventh of the space on the edge of the dial, the inner line on the dial being designated as Sunday, the outer as Saturday. The timer point is so controlled by a set spring that it removes the sensitizing from the silvered face of the paper as it is driven under this scratcher. The dials are graduated into hours, halves and quarters for all divisions of the day and night, the printing being on silvered paper in special process ink that does not set to the paper, but which can be scratched off with the instrument point, leaving a white record on blue background.



Dial of Phelps Vehicle Recorder, Showing Vibration Marks on Sensitized Paper.

The scratcher or vibrator recording point is operated, while the recorder is in motion, by the vibratory motion imparted from a weight connected to and controlled through the medium of a system of compound levers. This pointer is vibrated up and down over the sensitized dial with the slightest movement of the vehicle, and as the sensitized dial travels but 1-16 of an inch in ten minutes under the pointer, there is therefore scratched a perfectly true and even wide line indicating the exact lapsed time of the vehicle's movement. When the vehicle is stationary the sensitized dial, still traveling under the pointer, which is perfectly steady, shows a perfectly straight thread-like line.

The clock movement and recording mechanism are housed in an aluminum case with brass screw lid, having on its inner side an "off check" dog which records on the dial every time the lid is unscrewed. This dog cannot pass in its arc without engaging the scratcher point lever, which raises up the point half way at each turn of the lid, thus giving on the dial a record of each unscrewing of the lid at the exact day and time the device is opened or tampered with. The great feature of the invention lies in the fact that it is complete in itself, and does not require connection with any moving part of the vehicle in order to make its records.

LONG DISTANCE ROAD TRIALS

JUST now England is the theater for a public demonstration of industrial motor vehicles which began on September 9 and will end on October 5, during which period a distance of over 1,000 miles will be covered by all but the heaviest class of machines. Fifty-nine vehicles are competing in the seven classes, which are as follows:

Rating	Daily Run	Total Miliage	Maximun Speed
1,000 lbs.	70 miles	1,540 miles	20 m. p. h.
2,000 lbs.	60 miles	1,320 miles	20 m. p. h.
3,000 lbs.	55 miles	1,210 miles	12 m. p. h.
4,000 lbs.	50 miles	1,100 miles	12 m. p. h.
6,000 lbs.	40 miles	880 miles	12 m. p. h.
10,000 lbs.	30 miles	660 miles	Various
12,000 lbs.	30 miles	660 miles	5 m. p. h.

In the course of the demonstration the vehicles will pass through the principal commercial centers of England. At eight of these points exhibitions will be held. The various classes of vehicles have special routes. All vehicles however, are parked in the same space at night. The types represented are those operated by gasoline engines, by steam engines, and by a combination of internal combustion engine power and electricity. Forty-six of the vehicles are of English manufacture; thirteen are of European design.

The fares charged for riding any distance on Paris motor buses are 15 centimes (2.88 cents) for outside passage and 30 centimes for inside passage.

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Mismanaged Bus Service

Trouble Ensues Where Engineering and Traffic Departments do Not Co-Operate

WITHIN the past few months 160 motor buses have been withdrawn from the streets of London. The total now in service stands at 870. This time a year ago the number in commission was 668.

Interests hostile to the motor bus have sought to make it appear that the withdrawal from service of 160 machines marks the beginning of the end. They are particularly jubilant over the fate of an operating company which, through lack of capital, was forced into bankruptcy and compelled to stop the service of its 67 machines.

The withdrawal of a large number of motor buses from London service was confidently predicted a year and a half ago, when it became apparent that the executives of many of the operating companies did not possess any special gifts for administration. It was commonly believed at first that experience with horse vehicle passenger transportation was the chief requisite for success in operating motor vehicles in the same field of work. Rather late it was perceived that the administration of motor vehicles demanded executive services of a superior order to those which are called into play when horse labor is employed.

* * *

Examination of the affairs of the motor bus company which through insolvency was forced to retire 67 machines discloses administrative practices by which no public service motor vehicle undertaking could hope to prosper. The executive officers of the concern were utterly incompetent to discharge the highly responsible duties of their office. Their vehicles were not given that quality of stable care which is so needful for successful operation, and in consequence were objects of considerable attention at the hands of the police. The police power over London motor bus traffic is practically limitless. Often it is exercised with much harshness. Noisy and defective vehicles are ordered out of service if their condition is not remedied within two days after notification. How frequent these notices are given we are enabled to know from a report recently made by the chief commissioner of metropolitan police, who stated that during the past twelve months 587 motor bus drivers had been summoned to court for various offenses, while 6211 notices had been served upon operating companies to put their machines in such condition of repair as would make them acceptable to the police department.

In the face of such a report it is not surprising that many companies should have stopped operations, that others should have been forced to consolidate with rivals, and that still others have decided to temporarily withdraw their vehicles from service until such time as they can be thoroughly overhauled and a system for regular maintenance can be devised.

* * *

Until recently the high officials of London motor bus companies did not realize that it was of more importance to have the road service well maintained than to have a large number of vehicles in commission. The boast of one company, that it had 95 per cent of all its vehicles in service, was derided by the traffic and engineering departments of other companies who knew that such a percentage could only be obtained by keeping vehicles obviously unfit for service on the road. It is decidedly better to have eighty out of a hundred machines in such condition that they can earn at maximum all the time than that ninety-five out of a hundred should be behaving so badly as to eventually lead the police to forbid them the use of the streets.

The average daily earning capacity of a London motor bus is about $25. The cost of the machine is about $4,200. It is natural to suppose that greedy owners, imperfectly aware of the care which the mechanism of the vehicles should receive in order to perform to the best advantage, should delude themselves with the idea that a machine capable of earning $25 a day should not be withdrawn from service until it had actually broken down. The idea of investing in costly spare machines which might pick up the duties performed by those which needed overhauling and repair, would not be likely to meet with much encouragement from such people. This, coupled with the difficulty of securing machines of any kind, tempted many companies to operate in the rashest manner imaginable. There was little if any co-operation between the traffic and engineering departments. The former were constantly striving to keep machines on the road when the latter knew that many of them should be in the shop undergoing repairs.

It is unlikely that mistakes of this kind will occur in the future. The lesson taught has been costly and impressive. Many of the operating companies which have been forced to suspend operations will undoubtedly put their vehicles in commission again when, as seems likely, the London Passenger Traffic Conference agrees upon a uniform fare mileage which will not be so unprofitable as at present.

From the following table, which gives the list of London bus operating companies and the number of machines they employ, it will be seen how fast power has been concentrated in a few hands. Fourteen concerns, not enumerated in the list, have suspended operations, while others have been amalgamated with the larger companies.

Bus Owners	Vehicles in Service
Vanguard Motor Bus Company	347
London General Omnibus Company	197
London Road Car Company	191
Great Eastern Motor Omnibus Company	55
Thomas Tilling	34
Birch Bros.	16
Miscellaneous Owners (ten)	30
Total	870

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Wagon Maintenance

Tips to New Drivers and Caretakers About Things Likely to Escape Their Attention

BEFORE attempting to remedy a slipping brake by treating the friction surfaces in any of the ways that are recommended it is well to make sure that there is nothing hindering the contact of the parts when the lever or pedal is thrown into its extreme position. Through frequent and excessive adjustment it sometimes happens that the lever or pedal, as the case may be, reaches the end of its travel and "brings up" against something before the bands are applied at all. Or it may be that the linkage is so adjusted that it comes in contact with some portion of the frame, or with some part of the transmission, still without giving the brakes a chance to work.

Taking Grades on low Gear

It is desirable in the successful handling of an air-cooled motor to take grades on as low a gear as may be done comfortably, thus permitting the motor to run at fairly high speed, even though the rate of vehicle travel be comparatively low. By this means the speed of the fan is kept up and the circulation of air about the cylinders retained, even when the natural draught of the vehicle is so slight as to be of little or no aid for that purpose. Efficient cooling depends solely upon the quantity of air circulated about the motor, and it is necessary to maintain a good fan speed except when the vehicle speed is high enough so that the former element may be displaced by the induced circulation.

Braking too Hard

It is a great mistake to apply the brakes hard enough to skid the driving wheels, not only because of the excessive tire wear thus brought about, but also because of the danger of side slipping. A tire which has ceased to turn may be supposed to slide as easily in one direction as another. Hence whenever a side stress of any sort is brought to bear on the vehicle, as, for instance, a side slope in the road, or a stone under one wheel, the momentum of the vehicle, which alone impels it forward at the instant, may be partially overcome, thus swinging the machine violently to one side or the other. If the wheels are turning slowly instead of being firmly locked, they tend to maintain their direction in spite of the counter force, and will do so quite successfully in most instances.

Draining Water Jackets

If there is a chance in the circulating system for water to remain in pockets, after draining the system to prevent freezing, it would be a good plan to start the motor and run it on a low throttle and partly advanced spark while the water is running off. This will tend to clear the pockets, and the heat of the motor will evaporate any water remaining in the jackets. Of course the motor should be stopped before it gets very hot. In case the pump is of the positive or gear variety, a better expedient is to disconnect the hose close to the pump, between the pump and water jacket, after draining off the water elsewhere, unless there is a drainage cock provided for this purpose. The reason for this is that the positive pump will force water to the engine as long as water comes to it, and this water will be unable to run back through the pump. In case the carburetor is warmed by circulation of water, care should be taken to see that it also is properly drained.

Overhauling

There is room for considerable argument as to whether a machine which is running well should be left undisturbed as to its more ticklish parts, such as the carburetor, igniter and lubricating device, or whether it should be more or less completely dismantled periodically and inspected, with the risk of altering adjustments or introducing new elements of a disturbing nature. Many counsel the absolute ignoring of all parts which are in good order, except for the operations of cleaning and lubrication which are directly incidental to upkeep. Others make it a point to go over the machine thoroughly "about once in so often." Generally speaking, so delicately related are the various parts of the machine that their good performance is sufficient proof of their good condition, so that ordinarily it will do to let well enough alone, at least where gas-tight joints or delicate adjustments are involved.

Noisy Machines

Not a few wagons which have seen a year or two of service rattle and clatter in the most annoying manner. Yet frequently the cause thereof is but trivial. If, on the other hand, it is not remedied, considerable harm may develop in a surprisingly brief time, for every rattle denotes lost motion somewhere, and this in turn denotes an amount of unnecessary wear which is as rapidly increasing as it is needless. Generally speaking, the brake connections are the first to go astray in this respect, because they do not affect the running of the machine directly. Where the old type of external brake bands are employed they are quite apt to clatter against the flanges of the drums, while their connecting links and rods rattle about and soon become so loose and uncertain as to be dangerous from the weakening of the pins and clevises. Rattles from various other parts of the running gear, not directly connected with the power plant, are similarly needless and apt to be allowed to assume serious proportions if not closely watched. In most cases they can be checked at the beginning by the simple use of a wrench, while in others a little refitting or adjusting accomplishes all that is necessary. Neglect is the cause of more worn out machines and minor breakdowns than the average driver is willing to acknowledge, and where the cause of such mishaps lies at the door of the driver or caretaker no amount of "knocking' or complaints of long hours or hard work should be accepted as excuse for the circumstances.

An 18 passenger motor bus is to be operated between Sheridan and Buffalo, Wyo. The towns are 40 miles apart.

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ELECTRIC BUSES IN LONDON

ALTHOUGH not so well patronized as the more numerous gasoline machines, there are some electric buses operating in London which from the regularity of their service and freedom from road troubles attract the attention of transportation experts.

Six of these vehicles, each with capacity for 34 passengers, 18 inside and 16 outside, have been in use for two months. Six more are about ready for the road. Each bus makes two complete journeys, totaling 16 miles, before the battery is changed at the garage. Three minutes is required to change batteries, removal and replacement being accomplished in a manner similar to that employed by the New York Transportation Company in placing and withdrawing batteries from its motor cabs. The partially spent vehicle is run over a hydraulic lift fitted with a trolley which is raised to take the weight of the battery. The battery fastenings and connections are then released, the lift is dropped and the trolley carries the partially exhausted battery away to the department where it is freshened. Another trolley, which carries a fresh battery, is then moved into place on the lift, which is again raised, and after the battery has been connected and secured the vehicle goes into action again. American batteries are used.

A single motor is fitted to each of the vehicles now in service. Two motors will be fitted to the next lot of vehicles to be commissioned.

The motor buses of London travel nearly 100,000 miles every day.

Citizens of Rogersford, Pa., are tired of waiting for a proposed trolley line, and have plans under way to establish a motor bus line. It is proposed to run the machines from Spring City, Rogersford and Mingo to Trappe.

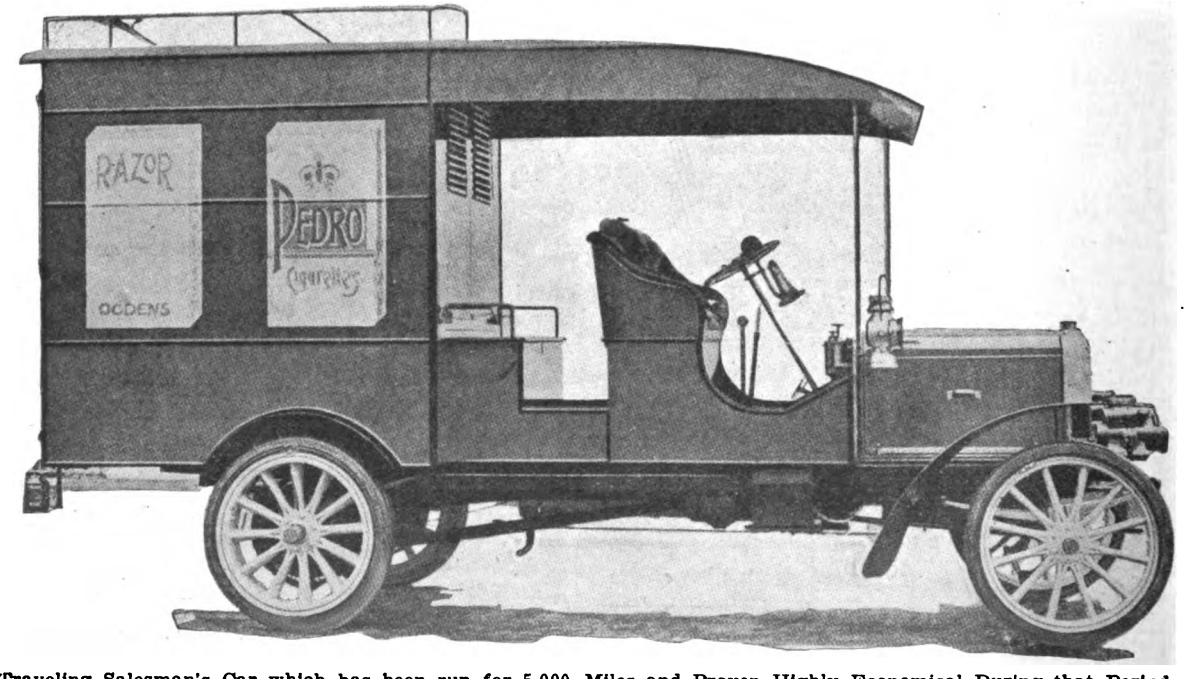
MOTOR CAB DRIVERS DISSATISFIED

MORE than 500 motor cabs are out of service in Paris as a result of conflict between drivers and operating companies over wages, disciplinary fines and fuel charges.

When motor cabs were first placed on the streets of Paris their drivers had no difficulty in earning a good living. As competition increased, however, the operating companies found themselves unable to deal so liberally with their men who, in addition to being supplied with uniforms and receiving 15 per cent of the gross takings, were allowed so much for the purchase of fuel. Recently the commission allowed on takings was reduced from 15 to 12 per cent, a reduction not welcomed in view of the fact that of late the cost of fuel has been steadily advancing. Probably the drivers could have borne with both of these misfortunes if they were not exposed to loss from other sources. When a Paris motor cab collides with a foot passenger for the first time, the driver is fined $12. For the second offense of like character he is fined $24. Discharge is the penalty for a third offense. The cab drivers must make deposits to cover these fines.

The drivers now demand the restoration of the original percentage of gross takings, and the abolition of the fine system. Under existing conditions the men earn about $2 net daily.

The London companies controlling the motor cab business in London are the United Motor Cab Company and the General Motor Cab Company. They use the same garage, have practically the same board of directors, and are, in fact, so closely affiliated that they are practically one organization. They are each capitalized at $2,500,000, and each controls 500 cabs, 1,000 in all. This number is soon to be doubled. The Fiat Motor Cab Company has also announced its intention of putting 400 of its vehicles on the streets in the near future, and no doubt is expressed in any quarter that there will be a demand for all of them.



Traveling Salesman's Car which has been run for 5,000 Miles and Proven Highly Economical During that Period.

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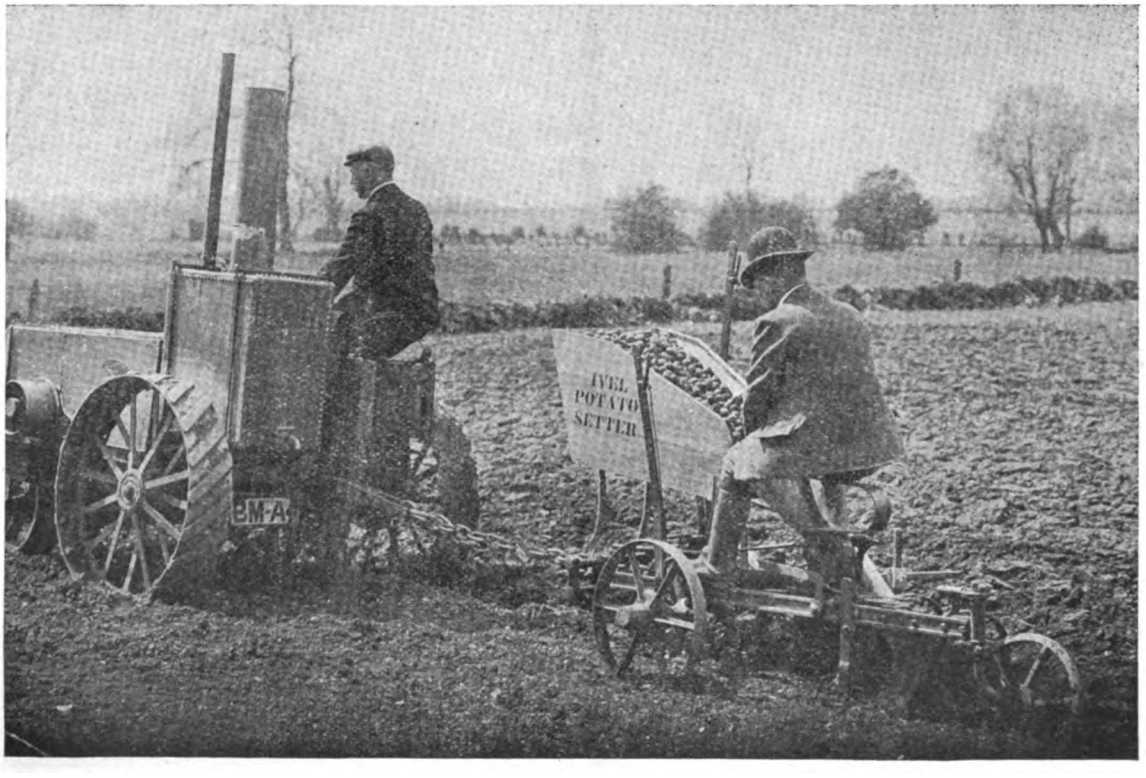
Following are some structural particulars of the motor buses operating in Paris: engine, four cylinder, developing 35-45 hp., air cooled; ignition, high tension magneto; clutch, multiple disc pattern; total length of chassis, 17 feet; length of chassis available for body of vehicle, 11 1-2 feet; front gauge, 5 feet; rear gauge, 6 feet; wheel base, 12 feet; length of front springs, 45 inches; length of rear springs, 51 inches; weight of chassis, 2 1-2 tons; front wheel diameter, 35 1-2 inches; rear wheel diameter, 42 inches; full seating capacity, 35 passengers; total weight of vehicle, fully loaded, 6 1-2 tons, of which 4 1-2 tons are on the rear axle. In winter the vehicles are heated by the exhaust from the engine. The exhaust is discharged above the roof of the vehicle.

The motor bus plant of the Berlin General Omnibus Company was recently damaged by fire, occasioning a loss of $550,000. Operations on one line has been suspended pending an adjustment of insurance claims. The gasoline is stored underground in huge metal tanks and, under pressure of carbon dioxide, the fuel is forced into ascending tubes attached to the outer wall of the storehouse that was. About three feet above the ground these tubes open severally into specially-constructed mouthpieces with rubber-tubing attachments; by means of these the bus tanks can be quickly and conveniently filled. The fire damaged these filling contrivances, and, but for the squabble over the compensation, they would have been repaired long ago.

Consul-General W. H. Michael reports that the electric-cab service for Calcutta, to which he had previously called attention as an American opportunity, has again come up in the form of a proposition received by cable from London, which reads: "Company with a capital of $500,000 is prepared to provide Calcutta with an excellent motor-cab service, commencing in October next, of 50 cabs, subsequently increasing the number to 200, but desire to have assurance that the corporation and police will encourage the enterprise and afford facilities. Cabs silent running and no nuisance; four-seated and capable of doing 100 miles a day." After fully considering the proposition, the city authorities cabled back this answer: "Chairman of corporation and commissioner of police welcome enterprise and will give all reasonable facilities."

The average cost of operating gasoline wagons, depreciation, wages, repairs and all other charges included, is estimated as follows by British accountants: 1,000 pound wagons, averaging 60 miles daily, $1,000 yearly; one to one and a half ton wagons, averaging 80 miles daily, $2,100 yearly; two and three ton wagons, averaging 70 miles daily, $2,500 yearly; five ton wagons, 5 cents per ton mile.

The price of gasoline in Paris often rises as high as 48 cents a gallon. This is sufficient reason for the use of alcohol and other substitute fuels in French industrial motor vehicles.



Motor Operated Potato Planter.

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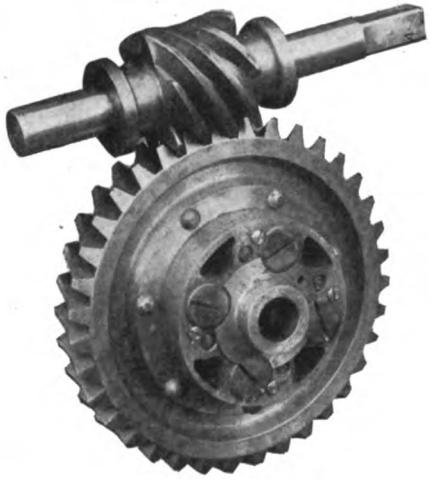
Information For Buyers

LONG DISTANCE ROAD TEST.—The Mitchell one-ton gasoline truck, which carried a 50 per cent overload all the way from Racine to New York, has dramatically demonstrated its usefulness in long distance freight transportation. The trip, which was planned solely for the purpose of determining the reliability of the truck under such arduous conditions as it was sure to encounter, attracted much interest at all points along the route. The route followed the lines of the Lake Shore and New York Central railroads,



Spiral Gear Drive Fitted to MitchellTruck.

stops being made at Cleveland, Toledo, Erie, Buffalo, Syracuse, Utica, Albany and Poughkeepsie. The route selected was not an easy one, particularly for a heavily loaded vehicle. There were many severe gradients to be overcome and the roads, owing to recent rains, were far from being in the excellent condition usually encountered at this season of the year. The spiral gear drive with which the Mitchell truck is fitted is the most interesting feature of its construction. In the accompanying picture it is shown complete, with the differential installed. The gears are made of steel, case hardened, and the ratio is 6 to 1. With this drive and a four-cylinder 20 hp. engine the truck climbs hills on the high gear quite as well as the average touring car, while its power on the lower gears is only limited by traction. Although this type of drive has been used in the Mitchell truck for a year and one-half, it is impossible to detect the slightest sign of wear in it. The amount of end thrust is extremely small as compared with that of the bevel type of gear. The worm is carried on the propeller shaft. The thrust, in going backward or forward, is taken by ball bearings interposed between collars on the gear and the rigid frame of the gear housing. The gear has a quick pitch, which enables the wagon to be readily moved by hand upon occasions when it is not desirable to make use of the motor.

A PROFITABLE YEAR.—Last month the annual stockholders' meeting of the Firestone Tire & Rubber Company took place in Akron, Ohio. The financial statement was by far the most favorable in the company's history. Not the least gratifying item was an increase of more than 60 per cent in total sales over the preceding fiscal year. The entire board of directors was re-elected and the following officers: H. S. Firestone, president and general manager; Will Christy, vice-president; S. G. Carkhuff, secretary; L. E. Sisler, treasurer, and Frank R. Talbott, assistant treasurer, the last named office having been created at this meeting. Plans were submitted at the meeting for still another addition to the plant, which will increase the capacity 40 to 50 percent over what it will be when the extension which is now under construction is completed.

Mitchell Truck with 50 per cent Overload which made the trip from Racine. Wis., to New Yory City.

LOGAN COMPANY CHANGES.—B. W. Twyman, who has been connected with the Logan company, of Chillicothe, Ohio, as sales manager and buyer, has severed his connection with the company, although he still retains an interest in it. He has been succeeded as buyer by B. A. Gramm, the company's general manager, and as sales manager by B. E. Stevenson. F. C. Lindoerfer, who has had long experience in the automobile business as superintendent of the Logan plant and the Roberts Motor Company, and as assistant superintendent of the Haynes-Apperson & Elmore Mfg. Company has been appointed assistant sales manager. The publicity and advertising end of the business will also be looked after by Mr. Stevenson, who has had long experience in this line of work.

COST OF OPERATING THREE-TON TRUCK.—The manager of the Kansas City Motor Car Co., Kansas City, Mo., makers of the Phoenix Truck, writes to say that service in that neighborhood since May 15th has covered 2,500 miles with load without any repairs, the cost per ton mile being 9¾ cents. Depreciation at 10 per cent, drivers' wages at $18 a week, fire maintenance at the rate of $250 a year, gasoline, lubricating oil and other items of expense are included in this estimate of operating cost.

LOGAN STOCKHOLDERS' MEETING.—The annual meeting of the stockholders of the Logan Construction Company, of Chillicothe, Ohio, was held on September 3, a large majority of the stock being represented. Reports of the company's business for the past year were presented in detail, and found satisfactory. The regular quarterly dividend on the preferred stock was passed. The following directors were elected: Jos. L. Schilder, B. A. Gramm, Geo. F. Hunter, Geo. H. Smith, C. F. Smith, John Kellohofer, W. A. Hall, E. L. Bergman, and B. E. Stevenson. The stockholders present inspected the new models which are in course of construction for the season of 1908, and were impressed with the belief that they are the most perfect, the strongest and the most efficient which the company has ever been able to manufacture.

TO INSPECT FIRESTONE AGENCIES.—Robert J. Firestone, sales manager of the Firestone Tire & Rubber Co., is making a trip to Mexico and Pacific coast points. He will remain for some time in the City of Mexico to establish a branch for the com-

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pany, after which he will proceed on a general tour of inspection of coast agencies.

HIGH POWERED TWO-TON TRUCK.—The Knox Motor Truck Company is now putting out a 2-ton truck driven by an Atlas 50 hp., two-cycle, three-cylinder engine.

SUPPLEMENTARY SPIRAL SPRINGS.—The Supplementary Spiral Spring Co., of New York City, claims that it is impossible to break a leaf spring which is fitted with its spiral springs. Supplementary spiral springs have been in use about twelve years on railroad cars, and in that time have fully proved their efficiency. Spiral springs are started at low initial tension. As they are loaded they increase in capacity until they are drawing on the leaf. The spirals are tensioned to the leaf. When the wheel rises over an obstruction, not being able to throw the load up, they are compressed. The instant the wheel drops they expand and absorb the rise, keeping the vehicle body in an even plane and elminating all vibrations. The employment of supplementary spiral springs is calculated to prolong the life of tires and relieve the engine of jars. Their action is precisely the same under light or heavy load.

NEW DETACHABLE CHAIN.—For some time past the Baldwin Chain & Mfg. Co., of Worcester, Mass., has been perfecting the design of a new detachable chain for motor wagons. It is now ready for the market. The chain, which is illustrated in this page, is composed of the usual rivets, rolls, bushings and side links, but so designed that it is riveted on one side only. The link is removable on the other side. The removable side link is pressed tightly over the ends of the rivets and held there by a metal collar or clip which fits into the groove in the ends of the rivets. This metal clip is not a spring, but a piece of steel substantial in thickness and quality, and retains its position on the chain because of its own quality and not from any spring action. The clips cannot become detached by accident, yet they are easily removed by anyone for the purpose of detaching the chain. The clips can be opened and pressed together several times before breaking. The clip holds the side link on the chain in its place. On account of its form, the side link cannot press up against it and cut it off, or come off, because it presents a broad bearing to the side link which will retain it in place and make the chain as firm as a riveted chain. These chains are now ready for delivery in all sizes. Prices are the same as for other chains.

LOGAN TRUCKS IN DRY GOODS SERVICE.—The Logan Construction Company, of Chillicothe, Ohio, recently shipped four of its new model R, four-cylinder delivery wagons to the Scruggs, Vandervoort & Barney Company, the big dry goods concern of St. Louis. The machines enable their owners to make one extra daily delivery. When only horses were employed it was found impossible to make more than two deliveries each way. Three daily deliveries are now made. Thus in addition to the cash economy which the use of the machines affords, there is a large increase in service efficiency.

THE HUBBARD TIRE.—The Hubbard tire, marketed by Arthur H. Middleton, 2821 North Broad street, Philadelphia, is composed of rubber sections which are bolted into recesses in a cast steel channel. The sections are held in place by bolts, which permit of sufficient movement to give the rubber freedom of action under compression. Thus the tire derives the full benfit of the resiliency of all the rubber used in the tire. The bolt heads and washers protect the rubber sections, so that the wear comes on the metal instead of the rubber, which greatly increases the life of the tires. The bolts also form a non-skidding surface. Inside of each bolt hole there is a steel tube or thimble, to prevent the bolt from wearing the wood, and to prevent the water from soaking in the wood. Each wheel has 28 long screws from 3 inches to 4½inches long, one between each bolt hole to prevent the wood from splitting. A truck, weighing 9,800 pounds, fitted with 8x36 inch Hubbard tires has been in operation for a year and a half, and the only repairs required were the renewal of bolts, which represent a very small expense. The tires are still in good condition.. The wheels of this truck are of cast iron, steel spokes, iron hub. The new style washer, which has just been adapted to the tire, is made of cast steel and covers the whole face of the rubber and extending over the edge. This keeps the rubber from being cut or torn by stones or other materials on the road, and does not affect the non-skidding properties, nor does it reduce the resiliency of the rubber. The cost of the tire, the customer furnishing the wheel, with 14 spokes to suit the inside circumference of the tire, (which will be furnished when required) is as follows: 6x36 inches steel tire for 4⅝ inches width of rubber, $100 per wheel; new rubber for same is $56, including bolts and washers; 8 7-16x36 inches steel tire for 6 15-16 inches width of rubber, $150 per wheel; new rubber for same is $84, including bolts and washers. If lost or destroyed, blocks can be replaced.

ECONOMY OF MOTOR DELIVERY.—The Logan Construction Company, of Chillicothe, Ohio, recently prepared a document in which the cost of operating one light Logan delivery wagon was compared with the cost of operating three one-horse delivery wagons and four horses, the fourth horse being used as a spare. The comparison was greatly to the advantage of the machine. The investment covering both forms of transportation follows:

HORSE WAGON INVESTMENT.

4 horses	$ 600
3 wagons	450
3 sets harness	75
Total	$1125

POWER WAGON INVESTMENT.

One gasoline wagon	$1,000

The upkeep of the two forms of equipment, based upon extended experience with both, is given as follows:

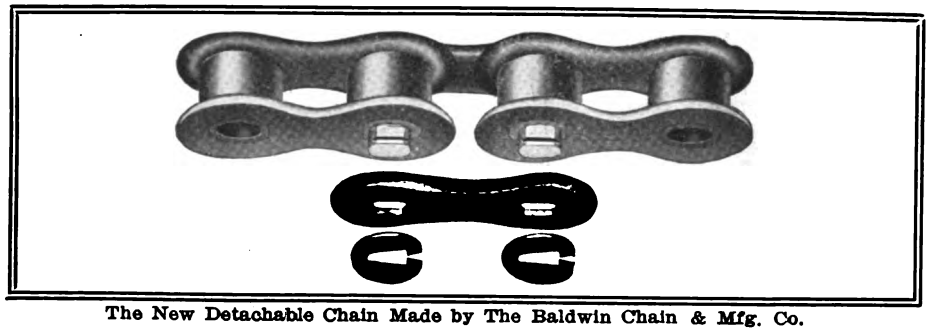
UPKEEP OF HORSE WAGONS.

Wages for three drivers, per month	$180
Feed, stabling, shoe'g etc., per month	80
Repairs, etc., per month	15
Total, per month	$275

UPKEEP OF POWER WAGON.

Driver's wages, per month	$60.00
Gasoline and oil, per month	12.50
Batteries and repairs, per month	2.00
Tire wear, per month	5.00
Total, per month	$79.50

Thus there is a saving on investment of $125, and a monthly saving in upkeep of $195.50, or $2,346 per year. Even if the motor delivery wagon was unable to perform the work of but two horse-drawn wagons, its employment would mean as saving of $110.50 per month, or $1,326 a year.



The New Detachable Chain Made by The Baldwin Chain & Mfg. Co.

SUPPLEMENTARY SPIRAL SPRINGS
GRAHAM PATENT
Teaming, Without Breakage
Save your tires your engine, your patience and nerves. Booklet 15 free)
Supplementary Spiral Spring Co.
1780 Broadway, New York (near 59th St.

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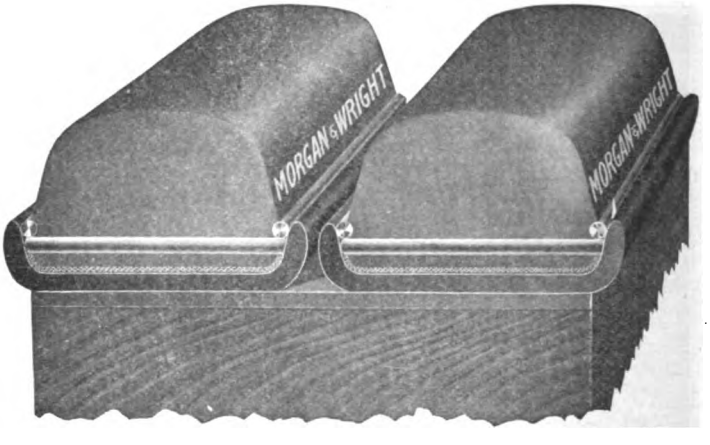
Morgan & Wright

SIDE-WIRE MOTOR TRUCK TIRES

Are Helping Users of Motor Trucks to Show a Profit over HORSE DRAWN Trucks

Made in Either Single or Twin Style

Made in Either Single or Twin Style



The rubber stock is specially compounded so as to secure great toughness without sacrificing needed resiliency. The fastening principle is recognized as the BEST principle for its purpose on the market.

A test of these tires is equal to a "boost" for Motor Trucks. Try them. Correspondence invited

MORGAN & WRIGHT, Detroit, Michigan

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 36 NOVEMBER, 1907 No. 36

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WALTER WARDROP, EDITOR

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Forced to Use Motor Wagons

New York Central Railroad Compels Westcott Express Co. to Buy Machines

THE compelling advantages of the motor wagon, which have never been wholly lost to view, are just now being forcibly brought to the attention of establishments which, left to their own devices, might be tempted to evade the plain obligations of business and remain content to transport merchandise by means utterly unsuited to the times.

Men vitally interested in the spread of motor wagon haulage have in the past often eased their impatience to see the machine universally adopted by calculating upon the very thing which is now occurring. They have fondly hoped that as some large concerns increased the sum of their investment in commercial motor vehicles and gradually caused horse transportation to be superseded, other industrial interests relying upon professional teaming service for the haulage of their merchandise, would demand. not as a concession, but as a right to which they were entitled, to be served by their carriers with all the conveniences which modern skill has devised. The fabric of business is so closely knit that as soon as it is discovered one section of it is profiting by the employment of an instrument which is capable of wide application, a sharp desire is created for its general use. It is to this jealousy that the telephone, the typewriter and many other aids to business owe their present wonderful vogue. Whatever is broadly useful must needs be adopted. Progress may be retarded, but it is not to be resisted.

* * *

The motor wagon is today receiving the attentive thought of thousands who it is unlikely will ever have occasion to make direct use of it. Foremost among those who hope to be beneficiaries of its traffic are the large railroads whose congested commerce invites the assistance of every auxiliary which is calculated to lighten the burden of existing conditions. Terminals which cannot be emptied of merchandise as fast as it is received cause endless confusion, loss of business and waste. Irritated shippers and consignees are with difficulty placated. The executive officers of the roads, maugre their frantic endeavors to procure more cars and increase the speed of rail traffic, find it impossible to handle all the business offered to them. When they accept it they cannot clear it promptly with the present facilities In this situation they welcome the motor wagon as a most useful ally. They know its capacity for fast and arduous work, and they are determined to make all whom they can coerce in action use the machine wherever it can be economically applied.

* * *

The first step in this policy was taken by the New York Central Railroad a short time ago. For a number of years past it has contracted with the Westcott Express Company for the handling of its freight and express in New York City. The Westcott company is the largest establishment of its kind in the country engaged in doing a purely local business. The contract in question expired the other day. When representatives of the two parties in interest came together for the purpose of renewing it, the spokesman for the railroad declared that unless the Westcott company was willing to install and operate a certain number of motor wagons, which number was to be gradually increased, the contract for haulage would be submitted to concerns which were in position to make extensive use of motor equipment. It is not known if the Westcott company acceded to this demand with good grace, but it is certain that the contract was drawn up and signed with a clause embodying the conditions above mentioned.

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Nobody who is familiar with the enormous volume of freight shipped over the New York Central Railroad, and the imperative necessity for clearing it with the utmost dispatch from depots and freight houses, will question the wisdom of the company's action in this matter. The duty of a common carrier is not merely confined to the transmission of merchandise over its lines of travel. It is reasonably expected to use all means to procure dispatch and the most suitable means for clearing its terminal storehouses. Evidently, therefore, it has the right to impose conditions upon its business allies as severe as are imposed upon itself.

* * *

It is hardly to be expected that this policy of coercion should appeal to the directors of the Westcott Express Company who heretofore have not given any sign that they would discontinue the exclusive use of horses before the employment of motor wagons was made mandatory in some such manner as described. A few years from date, however, when they have scored with their new equipment, they will be grateful to the powerful corporation which now compels them to introduce methods which are radically opposed to the ancient traditions of their business. The company is like a great many other establishments in the country whose final judgment with respect to the employment of motor wagons is arrested pending what they are pleased to term "the development" of the machine. Anxiety to avoid error in the selection of vehicle types leads to ultra-conservatism It is unnoticed that thousands of wagons now in use, while not representing what from an engineer's point of view might be considered the last expression of mechanical genius, are nevertheless capable of showing a decisive profit in operation. From the fact that the Westcott company had not up to the time of its coercion by the New York Central Railroad done more than casually consider the utilization of the motor wagon, it is likely it would have prolonged the day of its adoption until a "perfect" wagon had been evolved. Some consolation for its hectoring treatment must come to the company, however, from the contemplation of what other express companies have already succeeded in doing with the motor wagon. The experience of the Adams Express Company, which is determined to replace all of its draft animal transportation by the service of motor wagons, can hardly fail to sustain the courage of the Westcott company while its apprenticeship is being served.

* * *

Apart from the compulsion used to make it familiar with a form of transportation about which it knows little, though it should know much, the Westcott company is rather fortunately situated. It is early given opportunity to acquire the habit of speculating upon the large opportunities for gain which exist where wholesale substitution of horse wagon service is to be finally accomplished. Its business in the future will be modeled much after the plan made necessary by the employment of machines, instead of animals, machines which give precise service and which can be controlled, administered, stabled, cared for and maintained at much less cost, and with a greater degree of certainty, than is possible with its present equipment. It may be inconvenient to effect the change in investment here suggested, but that it can be done, and that it must be done, admits of no argument if the temper of its client, the railroad company, is any indication of what will transpire.

* * *

Not only is the Westcott company bound to furnish a certain number of motor wagons for the transportation of the New York Central Railroad's freight, but it is also obliged to install the vehicles within a certain length of time This is a broad hint from the railroad company to its carrying dependent that there must be no shirking of duty. It signifies that the railroad in forcing the express company to execute its wishes but expresses the desire of the shipping and traveling public for a better service.

The Westcott company has a practical monopoly of baggage handling in the eastern terminal of the New York Central Railroad. Its men only are permitted to board incoming trains, and its services only are called into requisition when the baggage of out going passengers is to be removed from house to depot. It does not transact all of the business of the railroad company, but it gets the lion's share of it. It will be necessary, therefore, to install relatively light and heavy motor wagons, the former for baggage and the latter for freight. Its present equipment consists chiefly of single horse wagons, although necessarily a considerable number of two-horse wagons are employed. The heavy wagons are largely engaged in hauling to and from depots, and in making journeys from Manhattan to Brooklyn

* * *

In other parts of the country express and transfer companies which sustain business relations with railroads have for some time past seen anticipating action such as the New York Central Railroad has taken with respect to the Westcott company, and of their own volition have taken steps to retain the interest of their masterful clients. In Chicago, Kansas City, Detroit, San Francisco and other places, much railway freight and baggage is hauled by motor wagons by concerns of this class.

The Scott Transfer Company, of Chicago, which in addition to its railroad business seeks custom from the public at large, is keenly alive to the value of its motor equipment. It is the youngest of the big transfer companies there, and naturally seeks by all means within its power to expand its business. Its gasoline trucks, however, have not been acquired merely for the purpose of exciting the curiosity of spectators on the streets, but because the company officers are firmly convinced that the motor wagon pays. One of its baggage trucks, loaded with almost twice as many trunks and pieces as any one of its horse teams could pull, is an object of daily interest to thousands as it moves its large load at a relatively high rate of speed from down town depots to suburbs. The company advertises its motor equipment and appeals to the public for patronage upon the strength of its possession. Its advertisements appearing last month read as follows:

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"We have been in business five years, but we have given Chicago a baggage transfer service which has made us famous. It is superior to all others. We use automobile trucks.

THE FRANK SCOTT TRANSFER COMPANY."

This advertisement expresses nothing but literal truth. The company has been giving, and is giving, a baggage transfer service which is making it famous. As it increases its motor wagon equipment its fame and its profit will increase.

TO SELL TRANSFER SERVICE HORSES

GRADUALLY it is being realized by big transfer companies that the motor truck is here to stay, and that if they are to profit out of the ordinary by its application it is necessary to take immediate steps looking toward its installation. The latest convert to the economy of motor trucking among such concerns is the United Transfer Company, which operates over 500 horses in Baltimore, Philadelphia and Washington

It is semi-officially announced that this company has decided to replace its draft animal equipment with motor wagons at the earliest possible moment. One of the motives assigned for this eagerness is of more than usual interest. The company in endeavoring to quietly dispose of its horses and wagons in the east found that it could not do so without making a heavy sacrifice, and accordingly shipped some of its stock to Pittsburg in the hope of getting better prices. This would seem to denote that when any considerable investment in horse transportation equipment has to be converted the owners are apt to be confronted with the unpleasant necessity of effecting the substitution at a loss. As the motor wagon movement gains headway it will become more and more difficult to realize upon such holdings, for every large team owner will then be desirous of selling, the natural effect of which will be to depress values. It is worth while remembering this.

COFFEE PLANTERS TO USE MOTOR TRUCKS

THE German-American Coffee Company, owning coffee plantations in the State of Chiapas, Mexico, is constructing a macadamized road connecting headquarters with Crusada, over which the company proposes to run motor freight trucks. The trucks will carry the coffee to and from Crusada, from which point it is conveyed by water to the port of Frontera, on the coast. Much of this road will have to be constructed over marshy ground. Its cost is estimated at $250,000.

In Detroit a company which operates motor express wagons recently added a number of limousine cars to its rolling stock, which vehicles are for hire at reasonable rates by those who may require them for shopping or commercial purposes.

Motor wagons and trailers are used by many market gardeners who ship their produce to London.

MOTOR EXPRESS COMPANY TO QUIT

ON January 1 the Auto Express Company, of Detroit, will discontinue its package delivery business. The reason assigned for the abandonment of this service, which was commenced about four years ago under circumstances which augured well for its future so far as the undiscerning eye could detect, is that the package rate charged is insufficient to maintain the costs of operation.

The letter which gives patrons notification of the intention to discontinue the service says: "After nearly four years' experience we have found it impossible to place our business on a paying basis with the rates which are paid for package delivery service in Detroit."

This in itself is a confession of injudicious management, implying that no attempt was made to charge for superiority of service. Motor wagon delivery is worth more than horse delivery in point of promptitude of service and speed. It should, therefore, be sold at a higher price.

It would appear that the rates for motor delivery have been from 5 1-2 cents to 15 per package. A couple of years ago the manager of the establishment publicly announced that the per package operating cost was considerably less than that afforded by horse wagon delivery. If this was the case, blame for the abandonment of the service must be ascribed to incompetent executive methods. Study of the stable management confirms this view.

A correspondent who has paid close attention to the service says: "Personally, I think that the business has been badly managed. The wagons, of the gasoline type, were too heavy for the class of work they were called upon to perform. They received no attention until a breakdown occurred. I have never seen a chain cleaned or properly lubricated, and in fact cannot remember of having seen a chain lubricated at all. The repair bills must have been enormous, as the company provided almost no tools for doing work. A file now and then seemed to be about the extent of the only investment for tools. No lathes, not even a drill press. Everything done as things are done where there is complete lack of system. The manager is not of a mechanical turn of mind. He started his business career in the pleasure car rental business."

It is easy to understand how a motor express company operating under such conditions would at the end of four years be forced to stop its service. There was no lack of patronage. At one time the company had as many as 80 accounts on its books. Apparently matters were going smoothly until one day, about two years ago, carelessness in the handling of the fuel supply caused an explosion which did considerable damage to stable and rolling stock. A year later fire again destroyed a number of vehicles. These two incidents do not indicate that good judgment was exercised in the conduct of the establishment. The wagons in service were almost 50 per cent too heavy for the work they had to perform. Such misapplication could only have one result—the operating and maintenance accounts were much greater than they would have been if vehicles well adapted to the duty to be performed had been employed.

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Underground Transportation

Chicago's Electric Freight Tunnel Does Not Relieve the Traffic Congestion Overhead

MUCH mail matter which formerly was hauled through the streets of Chicago by horses and wagons is now conveyed underground by means of electric rail trucks owned by the Illinois Tunnel Company, an organization which carries merchandise from railroad and steamship terminals to large wholesale and retail establishments within the central business district of the city. Upwards of two hundred tons of mail is hauled daily through the tunnel from railroad depots to the main postoffice.

* * *

Students of motor wagon transportation will naturally inquire why this work is not performed by road machines. While there is nothing in the physical condition of the service which absolutely prohibits motor wagons from undertaking the transportation of large quantities of mail within the district mentioned, it is nevertheless doubtful if such traffic could be operated at a profit either to contracting wagon owners or the government. The congested condition of the district served by the electric tunnel makes surface travel exceedingly slow. This fixed condition seriously interferes with the successful operation of motor wagons in mail service, in which the time element is of the utmost importance. To make matters worse, the hauls from railroad terminals to the central postoffice are comparatively short. Congested travel and short hauls are two factors which conflict with successful motor wagon service. But there is still another reason for not employing road machines. The street pavements in the territory served by the tunnel are worse than in any other part of the city. Trucking in the heart of Chicago, whether by horse or motive power, is decidedly uneconomical, and will so remain as long as street surfaces are unimproved.

The tunnel rail trucks, therefore, do work which neither horses nor motor wagons can profitably accomplish, and they do it with a precision which it pays the the postoffice authorities to recognize. When the heavy mails were hauled from depots to the main office by horses 1,000 interruptions to service per month was a common record. Last month the tunnel mail service was not charged with more than 16 such lapses. No doubt motor wagons could perform as faithfully as the tunnel trucks if their operation was confided to the care of experienced administrators and there existed no necessity for considering the cost of maintenance.

* * *

False pride occasionally leads people who have an interest in the sale or production of motor wagons to assert that there is no form of street transportation which may not be more economically performed by machines than by horse-drawn vehicles. The economy of the motor wagon, large is it is in general, in some situations is insufficient to make its use inviting. Only horses can haul some loads; only railroad engines others. But because upon occasion the motor wagon is unable to compete with either it does not follow that its inferiority is to be admitted. It is best in its field, which is large. Chicago's tunnel transportation may be conceded to be best in its small field, but this superiority in no wise diminishes the value of the motor truck in service for which it is adapted.

* * *

Observing the valuable service which Chicago's underground tunnel trucks are rendering one might be tempted to conclude that in course of time they will cause a heavy decrease in down-town surface trucking. So far as direct transfer service between large centrally located establishments and railroad depots is concerned tunnel transportation is worth while. But apparently it does not relieve the congestion which exists on the streets in the district which the tunnel system serves. Annually the volume of city merchandise transportation increases so largely that the tunnel facilities, even if they were doubled, would not be adequate to relieve the congestion in down-town street traffic. The real remedy lies in the employment of fewer surface carrying units, or power wagons. Eliminate the horse wherever it is practicable to do so and street traffic is eased from 100 to 300 per cent.

Considered in its relation to general surface transportation Chicago's tunnel service ministers to special interests rather than to the general mass of concerns having merchandise to move It is a wholesaler's auxiliary. Designed to lighten street traffic it obviously does not and cannot do so.

* * *

Even the Chicago postal authorities do not regard the tunnel service as all-sufficient for their special needs. They do not rely wholly upon it for short hauls. Its usefulness is supplemented by pneumatic tubes. In distributing mail to sub-stations they resort to still other means. For this service the present practice is to use postal cars attached as trailers to street cars, and so considerable is the speed attained by this method of transportation that it is extremely doubtful if any but the very speediest motor wagons would equal the street car service in point of time.

There remains, then, as opportunity for the motor wagon in Chicago the field of mail collection, and the work it has accomplished in other cities makes it practically certain that it will prove pre-eminent in this branch of postal transportation. Here its speed and all around economy is not disputed by the horse or the rail car. It is its lawful province.

* * *

All of the streets of the main business section of Chicago, running both north and south and east and west, are underlaid by a network of tunnels. Originally constructed as conduits for telegraph and telephone wires, theye were afterward enlarged sufficiently to accommodate tracks, over which run small motors drawing little

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cars for freight and express traffic. The tunnels are 8 feet high and 10 feet wide; they are 40 feet underground and cross the Chicago river at eight different points.

Arrangements have now been made by which a tunnel service is established between the main postoffice and the six principal railroad stations, connecting the latter with each other and with the postoffice. The mail is conveyed in box-shaped receptacles 4 feet high and 10 feet long, mounted on trucks, which are drawn by electric motors. Sometimes as many as half a dozen of these box cars are hitched together in a single train.

On its arrival at a railway station the mail matter is dropped through chutes into the tunnel where it is taken aboard by the little cars and transported to the postoffice. At the postoffice it is hoisted to the floor level above by means of buckets on endless chains. In the same way, the outgoing letters and packages at the postoffice are dropped into the tunnel through chutes, and conveyed to the railroad stations, where they are hoisted by chains of buckets to the track level and put aboard the trains.

The cars travel through the tunnel at the rate of 10 or 12 miles an hour; and, when the mail is first-class, the man who drives the motor engine is accompanied by a postal agent.

A $1,000,000 MOTOR CAB COMPANY

THE extraordinary demand for gasoline motor cabs is again illustrated by the formation of the Rover Motor Cab Company in London, with capital stock of $1,000,000. This company proposes to put 500 vehicles in service within the next two years. The cost of the machines, complete with tires, will be $1,480 apiece.

The allotment of vehicles will be as follows: 425 for railroad depot work and public hire, and the balance for private hire It is estimated that working three hundred days in a year the station and public hire cabs can earn $918,000 annually, while the private service vehicles, working two hundred days on an average each year, are expected to earn $200,000. This gives an income yearly of $1,118,000. The annual working and administrative expenses are calculated at $907,761, deducting which sum from the gross income leaves a yearly profit of $210,239, or about 20 per cent on the investment.

Vehicle earnings are calculated at $7.20 a day which, it will be observed, is considerably lower than the present average rate of earning. Present earnings of the best motor cab companies in London vary from $10.80 to $11.28 per vehicle per day. It is, however, a sign of the sanity of the times in motor cab enterprise that the Rover company should not have been tempted to swell its profit balance in advance of the period when it commences operations.

Electric motor bus service will soon be commenced in the City of Mexico.

Electric trucks are being used with success by Wisconsin pea canners.

ROAD TRAIN WORKING COSTS

ACTUAL working costs of a Renard road train, consisting of a motor wagon and two trailers, have been tabulated after a demonstration lasting for a month. If the length of haul had not been so short, and the number of stoppages so numerous, the economy shown would have been greater. As it is, however, the results are very remarkable. The demonstration, made in Antwerp, necessarily shows lower costs than could be obtained in this country, where wages are higher than abroad. Even if the wage items were doubled to meet our scale there still would remain a very low per ton mile cost, much lower than could be expected from draft animal transportation in the same service.

The train, composed as already indicated, carried 8 1-2 tons of merchandise, four tons on each of the trailers and half a ton on the motor wagon. Thirty-two miles was the daily haul. The daily load, for five round trips, was 42 1-2 tons. Daily working costs under these conditions were as follows:

Gasoline, 17 1-2 gallons	$ 4.20
Driver	.96
Assistant	.68
Repairs, 2 1-2 per cent on capital of $8,908.80 (300 days a year)	.74
Depreciation, 20 per cent on motor wagon 300 days in the year	3.68
Depreciation, 20 per cent on two trailers 300 days in the year	2.24
Lubrication and sundries	.48
Total	$12.98

This works out at the rate of 4.6 cents per ton mile. The cost per ton mile is calculated by dividing the daily expense by the sum of the daily mileage multiplied by the average of one load hauled.

The daily working cost of a train composed of a motor and three trailers, pulling 12 1-2 tons each trip, making five trips and traveling 32 miles, was demonstrated to be $14.24 or 2.14 cents per ton mile. If each trailer had carried 5 tons and three of them had been employed the daily working cost would not have been any greater than if each only carried 3 tons, but the per ton mile cost would have sunk to 2.2 cents per mile.

An electric ambulance used by the Munich fire department is driven on all four wheels and weighs 7,000 pounds with full load of apparatus and ten men. The battery is placed over the front wheels. Its maximum speed is 30 miles an hour.

A Chicago street railway conductor was recently awarded $10,000 damages as compensation for injuries sustained from the collision of one of Lyon & Healy's motor trucks with the rear end of his car. Careless driving on the part of the truck driver was established to the satisfaction of the jury.

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An American Road Train

Important Features of Design Incorporated in a Gasoline-Electric Train

CONSIDERING the useful and economical work of which the motor road train is capable it is rather remarkable that so little has been done to found an American industry upon the production of vehicles suited for this class of transportation. Army executives, quarrymen, millers, mine owners, coal merchants, grain handlers, brewers, agriculturalists and many others having large masses of materials to transport, are finding, and will continue to find, that the road train decreases the cost of hauling while it increases the daily tonnage far beyond the capacity of present equipment.

* * *

About five years ago a feeble attempt was made to introduce the Gibbs train, which consisted of a gasoline-electric locomotor and trailers having motors in each of the trailer wheels. The failure of the company which designed it threw this experimental train upon the hands of the company which built it, and ever since it has been rusting in idleness. Such practical work as it accomplished, however, proved that it was very economical. It hauled loads varying from 12 to 15 tons at about four cents per ton mile. But it was conspicuously lacking in many improvements which distinguish modern design of the same character. For example, its trailers were not intended to be steered so as to track accurately in the path of the locomotor; the train, therefore, could not be steered or backed with precision. Besides, it was unnecessarily heavy.

This early experiment, though barren of profit for its projectors, led to the arousal of much interest in the subject of road train transportation. At that time the Renard train, of French origin, was striving for recognition in Europe, and the superior ingenuity of its design, which upon several occasions has been described in these pages, very naturally attracted the attention of transportation economists. Until lately it has had the field to itself.

* * *

Recently, however, American invention has aspired to break in upon this monopoly. The Alden-Sampson Mfg. Co., of Pittsfield, Mass., believing that the problem of carrying large quantities of merchandise over considerable distances is most satisfactorily solved by the use of the road train in which each unit is self-propelled, set its engineers the task of producing such a train. The design they have succeded in evolving, and which will be on exhibition at the second New York automobile show, permits the greatest flexibility in handling under all conditions, as well as a carrying capacity up to the limit of loading of the trailing car wheels, the latter a very important feature of design not possessed by the Renard train.

* * *

Before proceeding to their work the Alden-Sampson engineers laid down these rules of construction as indispensable to sound design:

First—The tractor should be capable of being steered with either end attached to the train and with equal facility in either direction, in case it is necessary, when no loop is provided to detach from one end of the train and with no room to turn, run by and attach at the other.

Second—The tractor should be capable of being handled entirely by one man.

Third—The tractor should carry as much paying load as will bring its total loaded weight up to that of a car.

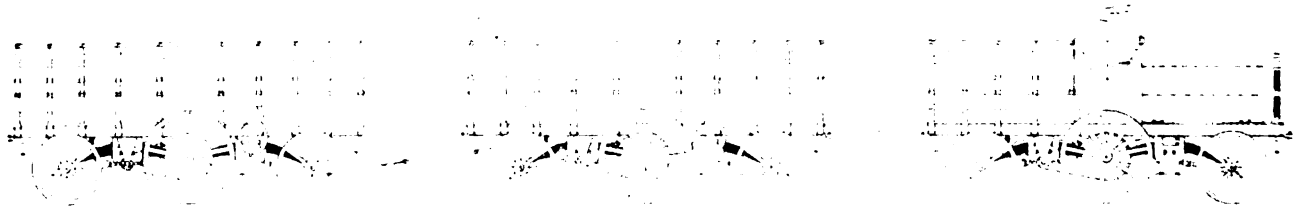
Fourth—The cars should be capable of running in either direction, double ended in every respect and should track as closely as possible on curves.

Fifth—Each car must be propelled by its own power, transmitted to it from the tractor, and be capable of a change of speed relative to other cars in the train, that strains may not be set up in rounding curves, inequalities of the road, etc.

Sixth—The first cost and upkeep of rubber tires should prohibit their use on a commercial vehicle of this class. The six-wheel type of vehicle meets all the conditions imposed in the most mechanical and simplest way. Tractors and cars should be built with running gears exactly alike and interchangeable.

* * *

The Alden-Sampson train is operated on what is known as the gasoline-electric system, with variable voltage and series parallel controls Power is furnished by a gasoline engine running at a slow rate of piston speed and of a capacity which varies with the number and load rating of the cars in the train. The engine drives a dynamo which supplies current to the motors on the tractor and on each of the trail cars. Owing to the use of steel tires a separate spring supported frame is provided for the power plant and radiator on the tractor. The suspension of this auxiliary frame, which is supported on the main frame, protects the engine, generator and cooler from



The Alden-Sampson Gasoline—Electric Road Train

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damage due to twists in the main frame and from undue deterioration which might be caused by road shocks. Nothing less than 54-in. driving and 42-in. steering wheels were considered, and with half the gross load carried on the large center driving wheels the steering wheels, carrying only a quarter of the load, can be smaller, permitting a wide steering angle and lighter construction. Accessibility, strength, saving of dead weight, large wearing surfaces, conveniences for oiling, and all of the many things which though classified as minor details are really of great moment to the operator on the road, have been given careful attention. As marketed the train consists of the tractor and two trail cars, but it is obvious that any number of trailers may be employed provided their load does not exceed the power generating capacity of the engine. Car platforms are 17 feet long by 4 feet 2 inches wide, with sides 4 feet high. Each car weighs 7,000 pounds unladen. The wheel gauge is 72 inches. The entire train can be turned within a radius of 20 feet. Speeds and loads under different road conditions are as follows:

Road Condition	Speed	Load
Hard macadam, level 6	m. p. h.	20 tons
Hard macadam, 5% grade 3	m. p. h.	20 tons
Hard macadam, 10% grade, ..2	m. p. h.	20 tons
Soft dirt road, level 5	m. p. h.	20 tons
Soft dirt road, 5% grade 2½	m. p. h.	20 tons
Soft dirt road, 10% grade 1½	m. p. h.	20 tons

* * *

Owing to the method of applying power to each car, which makes each capable of propelling its own weight with load independent of another, it is found that under all normal conditions of road surface it is possible to use the regular steel tire fitted to all horse-drawn vehicles. There are some conditions where the tractive effort of a more resilient tire proves necessary. In such cases either a wood or rubber base tired wheel is supplied. Under no conditions is the use of other than steel tires necessary on the steering wheels, as the front and rear steering is so easy that these wheels rarely slip in practice, and when doing so correct themselves immediately.

* * *

The voltage is arranged to be varied through a range which insures that the full current capacity of all the motors is within the capacity of the engine. Series-paralleling is effected by a rotary switch which is interlocked to the starting rheostat, making it impossible for the operator to damage the apparatus. Switches are provided enabling the tractor to operate the train with its own motors only, or to enable a car or cars to be operated without running the tractor, enabling the cars to be run about in a yard and the train made up by the use of an extension motor cable of suitable length. From the tractor the electric current is conducted through the train to supply power to two motors on the tractor and on each car. The motors are spring suspended and are especially designed to withstand the rough usage and neglect incident to commercial road work. The motors are back geared through steel gears running in an oil bath, driving the center wheels through a final 1 3-4 pitch roller chain drive.

As each wheel is independently driven no differential gears or equalizing devices of any kind are required in the train. The complete control of the train by electricity enables it to be easily handled by one man, and there being no gears to shift nor clutches to engage it is easily operated by any driver. The tractor is steered through a substantially designed irreversible steering gear which insures freedom of accident from road shocks. The cars are steered by a tongue from the rear of the tractor to the axle of the first car and from the rear of each car to the axle of the following. Connection may be made at either end of any car at will, and the steering is so designed that the cars track almost exactly on the sharpest curves. The front and rear wheels are the steerers and are cross connected so that in rounding a curve all six wheels follow true concentric radii. Draw bars are used between the cars, but as each car is self propelled the function is only to preserve correct distance and equalized traction.

* * *

Under ordinary conditions braking is effected electrically through the motors and controlled by a point on the controller, which gives a braking power equal to the capacity of the motors and is very smooth in operation and convenient to handle. For emergency use on severe grades a hand wheel located directly under and concentric with the steering wheel on the tractor, is used to set powerful expanding shoe brakes within the sprocket drum on the tractor driving wheels. A long range of wear before adjustment is necessary has been provided.

The same brake apparatus is applied to the cars to be operated, if necessary, in mountainous country by an assistant riding on the cars.

* * *

The center or driving wheels are 54 inches in diameter, with 5-inch tires. The steering wheels are 42 inches in diameter with 3½-inch tires. The body is supported on the three axles through four semi-elliptic springs of extra length, which are pivoted and also guided in pedestals on the frame and have the functions not only of springs, but of equalizing beams and axle guides as well. The body is thus suspended in the simplest possible manner, but the load on each axle is equalized no matter how rough or uneven the road. The axles being located fore and aft by radius rods, with the ends of springs simply resting in pockets on them, great flexibility is obtained and strains under the most severe conditions have no power to exert harm.

A San Francisco motor bus, in order to avoid collision with a street car, was steered into a trolley pole and 30 passengers were spilled in the street. The injuries they sustained were slight.

There are six motor wagons in the service of the health department of London. They remove over 37 tons of street filth every week. Five of these machines are used at night for washing and cleaning the streets.

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The Cost of Bad Streets

Delayed Traffic Not the Worst of the Evils Resulting From Ill Kept Thoroughfares

EVERYONE who studies municipal economy and takes the least interest in street maintenance perceives that horse traffic is an unsupportable burden. Not only must the surface be selected with a view to making the most of an inferior form of transportation, but taxpayers must submit to continual expense for repairs which are among the most obvious defects of such traffic. Granite, asphalt, brick, wood, macadam—none of these pavements suit the heavy footed and pounding horse. Granite is too hard, asphalt is too slippery, while brick, wood and macadam are soon destroyed by stamping hoofs. If the horse could be trained to glide he might persist in business; as this is impossible we must pay heavily for the damage he works with his feet.

* * *

Consider the mischief and expense which draft animal transportation causes in Chicago, with its 1,545 miles of paved streets, only 612 miles of which are fit for traffic. Here we discover that only 40 per cent of an investment representing many millions is actively useful. Horses have practically destroyed the value of the remaining 60 per cent. Once every ten years or so, streets which would accommodate motor wagons for centuries are rendered unfit for draft animal traction.

We have the word of the superintendent of Chicago's streets for it that the sum of $750,000 is annually required to repair the damage done by horse traffic. Of this sum $500,000 is needed for asphalt repairs, $25,000 for granite, $100,000 for macadam and $125,000 for miscellaneous pavements. Is it possible that motor wagon traffic could cause such expense? Or, if it did, is it possible that it would fail to show more economic results?

* * *

A total supersession of Chicago's horse-drawn vehicles by motor vehicles would remove two-thirds of the present carrying units. That in itself would lead to a corresponding lessening of the volume of travel and this, in turn, would cause the cost of street maintenance to be greatly diminished. With the decrease in the number of carrying units would come relief from the traffic congestion in the down-town district, which is now one of the city's great problems. It is not charged as a fault of the motor vehicle that it causes destruction to the surface of durable pavements. It is, however, alleged and admitted that the attrition set up by rapidly moving motor vehicles, whose wheels are shod with pneumatic tires, causes considerable rapid wear to soft surfaces such as macadam. According to the best information obtainable granite, good wood paving and asphalt should last indefinitely and require the minimum of expense for repairs if only motor vehicles were allowed to travel over such surfaces. If, therefore, all the merchandise transportation of a city was accomplished by means of motor vehicles over such surfaces, the necessity for incurring heavy annual expense for street maintenance would not exist. Further than this, the soiling of the streets, which is another count in the indictment against the horse, would probably be at an end, for such motor vehicles as drip oil, and so cause destruction to asphalt surfaces, could easily be compelled to provide pans for catching the harmful exudations.

* * *

It must not be supposed that the executives of the city of Chicago have overlooked the economy of motor vehicle traffic in this respect. The truth is that city merchandise transportation is, and of late years has been, one of the big problems of administration. If the city had at its disposal sufficient money in order to maintain streets for draft animal transportation, it is not likely that we would hear anything more of the subject than would naturally arise from comparing a method of transportation which is notoriously wasteful with another which is notoriously economical. But, unfortunately, the city is without money to improve its streets Efforts are being made to secure the passage of a bill in the state legislature which will enable the city to impose a vehicle tax, the revenue from which, if judiciously applied, should go far toward giving the city superior traction facilities. Just now, however, the administration finds itself in a very unpleasant predicament, having no money to spare for street improvement and being confronted with the prospect of the lapse, within a year, of a ten years' maintenance guarantee upon many of its principal streets. The old cedar block pavement is not worth repairing. There are miles and miles of it to accuse past administrations of the folly of applying a palliative where a remedy is called for.

* * *

In almost every respect the methods employed to maintain our city streets in good condition are surprisingly inferior to those practiced abroad. The rapid expansion of our commerce may excuse much that has been done in the past to facilitate the movement of city merchandise, though the frequency with which street surfaces have to be improved or relaid would seem to indicate that the needs of such traffic have not been well studied. Graft, ignorance and civic indifference have undoubtedly combined to give us thousands of miles of streets of which the meanest villages might well be ashamed. Many of the down town streets of Chicago are probably the worst in America. They have been in bad condition for ten years or more, and are becoming worse all the time. They are now beyond repair. The grind of horse traffic is so rapidly destroying others that as a moderate measure of self-protection the city authorities were compelled to pass an ordinance providing for the use of wide tires. The narrow wheels with which light and heavy wagons of the past have been fitted have not done as much damage to Chicago's streets as horses, but they certainly have not contributed anything to their maintenance.

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The economy of well kept streets is little understood by the mass of people. Delayed traffic, whatever the cause, is a fixed expense on the cost of all merchandize. Moreover, bad streets annually cause enormous loss which is expressed not merely in increased cost of product made and purchased, but in deterioration of rolling stock and shortening of the period of usefulness of draft animals. There are other losses which probably are of even more importance than these. Reflect upon the cost of keeping the streets of a city clean under existing conditions and what the same service might cost if motor traffic was in the ascendent. Nobody ever yet saw clean streets with granite pavement, and yet the granite pavement is supposed to be the only surface suitable for heavy horse trucking. A municipal health expert, famous for the keeness of his observation, once remarked that the security of the inhabitants of a large city against the ravages of disease was not any greater than the cleanliness of the streets. To this sage observation he added the remark that badly kept streets were unhealthy ones. Evidently, therefore, there is in city transportation a point where the people who do not use the streets have a strong interest in seeing them well maintained.

GOOD WORK BEING DONE BY MAIL WAGONS

SOME idea of the success of the automobile mail service that Postmaster Owen inaugurated in Milwaukee some time ago may be gained from the fact that last month the percentage of the connections on time of the machines in the service was 97½ per cent. During the same period the percentage of the trains arriving in Milwaukee on time was but 67 per cent. A regular schedule for the motor wagons is maintained and a careful record is kept of the number of times that the machines fail to arrive and depart on time. When it is remembered that the vehicles make seven and eight trips to and from the various sub-stations besides those made to and from the depots each day, the promptitude of the service is very remarkable.

A company organized with a capital of $1,000,000 has been formed in Ireland to operate motor buses and motor wagons around Dublin and its suburbs, Belfast and its suburbs, in and around Cork, Queenstown, Waterford, Galway, Tuam, and along all the principle tourist routes. The business of carrying agricultural produce and general merchandise in the neighborhood of these cities is to be undertaken, as well as that of express delivery of parcels, etc., within these cities. The company is planning to run special services, both for passengers and goods, to link up certain routes on the Irish railways, and to act as auxiliaries thereto. It has entered into a contract for the delivery of 75 buses.

A company is being organized to operate a motor bus line out of Crawfordsville, Ind., to various surrounding points of interest.

DAILY OPERATING COSTS

A gasoline truck maker who has sought enlightenment concerning the economy of his product from those who are making use of it gives the following estimates of daily expense for operating two, three, four and five ton wagons as representative of average service when the machinses are well cared for and well applied:

Operating Cost of 2-Ton Trucks

Range, 50 miles a day.

Gasoline, 5 miles a gallon	$1.50
Cylinder oil, one gallon	.38
Repairs and renewals	.50
Tire charges, 2 cents a mile	1.00
Driver's wages	2.50
Total daily expenses	$5.88

Cost of Operating 3-Ton Trucks

Range, 50 miles a day.

Gasoline, 5 miles a gallon	$1.50
Cylinder oil, one gallon	.38
Repairs and renewals	.60
Tire charges, 2½ cents per mile	1.25
Driver's wages	3.00
Total daily expense	$6.73

Cost of Operating 4-Ton Trucks

Range 50 miles per day.

Gasoline, 4 miles a gallon	$1.87
Cylinder oil, one gallon	.38
Repairs and renewals	.75
Tire charges, 3 cents per mile	1.50
Driver's wages	3.00
Total daily expense	$7.50

Cost of Operating 5-Ton Trucks

Range, 50 miles a day.

Gasoline, 4 miles a gallon	$1.87
Cylinder oil, one gallon	.38
Repairs and renewals	.75
Tire charges, 4 cents a mile	2.00
Driver's wages	3.00
Total daily expense	$8.00

A thick rope and leather tire is used as an emergency substitute by a Berlin motor cab company when puncture occurs to one of the pneumatic tires with which all its vehicles are fitted. When a pneumatic tire is punctured the driver removes it from the rim, places the emergency tire on the ground in a direct line with the wheel which it has to fit, and then drives the cab cautiously forward, so that the rim of the wheel runs on the emergency tire. The weight of the vehicle automatically presses the emergency tire into the rim, and the two ends are covered by a leather band.

Motor cabs are being introduced into many small German towns.

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Out of Their Element

Commercial Motor Vehicles Smothered in the First of the New York Automobile Shows

TOWARD the close of last month a public which of its own accord is rapidly learning to distinguish between the relative importance of business and pleasure automobiles was given another peep at the mirth-provoking comedy which is staged twice every year in New York for the purpose of fostering the illusion that the industries which are grouped around each machine are closely and harmoniously related, and composed of like factors.

The first of the national shows, with its six exhibits of commercial motor vehicles, no more expressed the state of development in minor transportation than it did the size, activity or importance of the market for such machines. It would be trifling with words to characterize such a meager display as representative. It would be equally bad taste to compliment the management of the show upon its audacity in inviting people to witness such a spectacle while under the impression that it was decidedly representative of the industry.

Isn't it about time to ring down the curtain upon these unenlightening and misleading side-shows? The impression they give is the very opposite of that expected by those who contribute of their means to make them possible. Throughout the year millions of dollars' worth of commercial motor vehicles of one kind and another are purchased. A time comes when the industry is expected to be on dress parade, and, lo, there are half a dozen concerns to mark its size and proclaim the extent of its transactions. What a satire! What folly!

It is with reluctance we attempt the relation of what was to be seen at this show by those interested in the subject of economical road haulage. Not that the little which was on exhibition does not deserve mention or invite praise. Even microscopic proportions may possess interest. But the truth is that if the models of four of the principal exhibitors—the Reliance, Rapid, Mack and Logan companies—had not been on view there would have been nothing to seriously occupy reportorial attention.

No electric wagons, trucks or buses, were on view.

Nor were there any steam machines to be found in the exhibition hall.

It was a spectacle contrived for the purpose of deceiving the witless and capturing their money at the box office. Let us hope its like will never be seen again.

And now for the description of the things worth while.

Reliance Company's Exhibit

The Reliance Motor Car Company, of Detroit, showed three models, one of two ton capacity, another rated at three tons, and a third at four tons. All of them have capacity for 25 per cent overload. For the past three years this company has built only one chassis, rated at two tons, but having maxium capacity of three tons. This two-ton model has been built in lots of fifty. During the past year the company has been developing and testing its two heavier models which are equipped with engines having more horse power than the two-ton machine, and the parts dimensions for which have been increased to care for heavier loads.

The engine of the two-ton truck is of the two cylinder two cycle variety. The three-ton truck is equipped with an engine of the three cylinder two cycle variety. The four-ton truck has a four cylinder two cycle engine. The engine rating of the two-ton truck is 30 hp. of the three-ton truck 45 hp., and of the four-ton truck 60 hp. In all three models the bore of the engine is 5 1-8 inches and the stroke 5 inches. The ignition in all models is produced by jump spark. The transmission is of the sliding gear type, with three forward speeds. The drive of all models is from jack shaft by double side chains to rear wheels. Front axles are heavy I-beam drop forgings with drop forged steering knuckles and roller bearings. The rear axle of the two and three-ton trucks are of solid three inch round forged steel. The rear axle of the four-ton truck is 3 1-2 inches in diameter forged steel. The frame of the two and three-ton trucks is cold pressed steel. The frame of the four-ton truck is heavy channel steel. Wheels of the two-ton truck are 32 inches in diameter, while those of the three and four ton truck are 36 inches. The two-ton model is fitted with 4 inch tires throughout. The 3-ton model has 5 inch tires in front and 3 1-2 inch twins in the rear, while the 4-ton truck is fitted with 5 or 6 inch tires in front and 3 1-2 or 4 inch twins in the rear.

The chassis of the 2 ton truck has a frame 36 inches wide by 10 1-2 feet long, back of the driver's seat. Bodies may be built any width up to 6 feet, and in length 10 1-2 feet to 13 feet. The chassis of the 3-ton truck has a frame 36 inches wide by 10 1-2 feet long, back of the drivers seat. It will accomodate any body width up to 6 feet and any body length from 10 1-2 to 13 feet. The chassis of the 4-ton truck has a frame 36 inches wide by 15 feet long, back of the driver's seat. It will accommodate any width body up to 5 feet slope and a 4 feet level and of any length from 15 to 17 feet. Tread of the 2-ton truck is 56 1-2 inches, that of the 3-ton truck 58 inches, and that of the 4-ton truck 77 inches. The wheel base of the 2 and 3-ton models is 108 inches, and that of the 4-ton model 136 inches. All models are fitted with foot operated and emergency brakes.

Logan Company's Exhibit

The Logan Construction Company, of Chillicothe, Ohio, displayed three models, a light delivery wagon rated to carry 1,500 pounds, a one ton wagon with engine rating of 20 hp., and a 3-ton truck with engine rating of 40 hp. The one ton model is a miniature of the 3-ton machine. The one and 3-ton models are new. A description of the 3-ton model, therefore, will answer for both.

All points of friction are carried either on ball or roller bearings. All gears are of chrome nickel steel. The propeller shaft is of the same material. The front axle is magnanese bronze, the rear a solid steel forging. The frame is 5-inch rolled channel steel. The engine, which is water cooled, is of the four cylinder variety. It is mounted on a 5-inch pressed steel subframe. The oiler has been cast with the engine crankcase, circulation being assured by a gear pump. Tests have shown a high efficiency combined with great economy in the matter of lubrication of these trucks. The clutch is of the multiple disc type. A propeller shaft with two universal joints transmits the power to the gear set by which three forward speeds and reverse are

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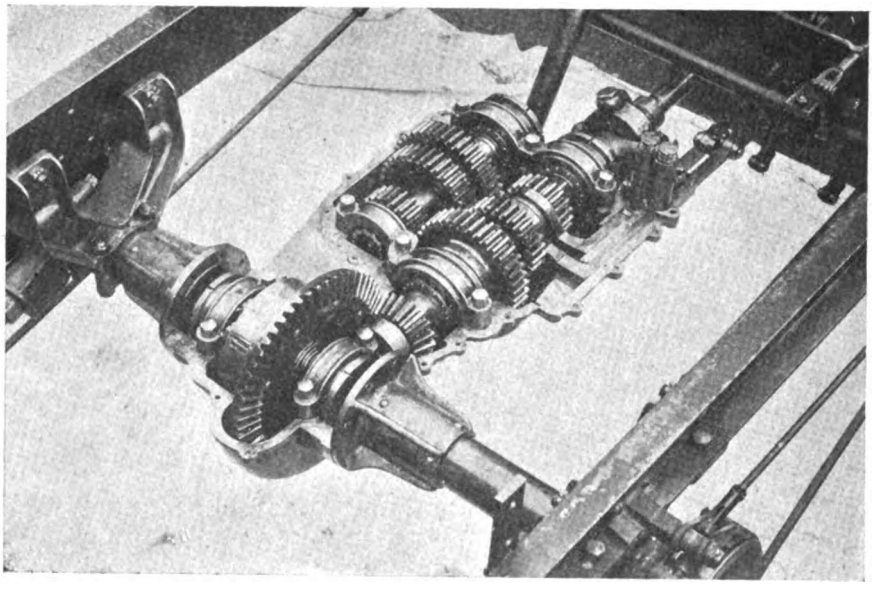
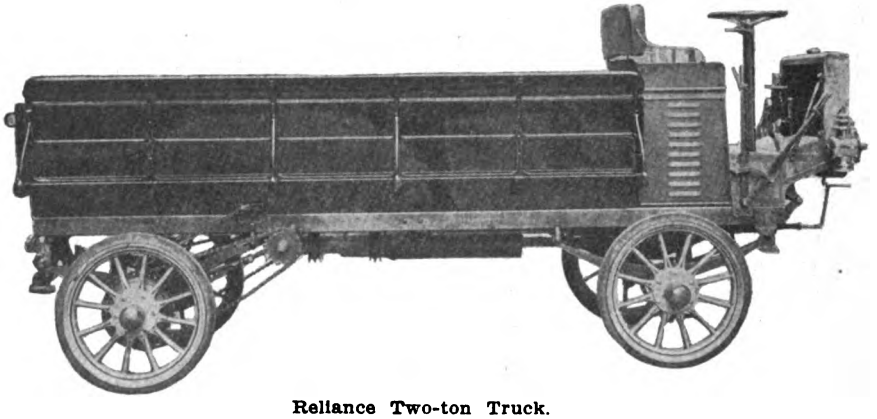
obtained on the selective principle. From the countershaft to the rear wheels the drive is taken by side chains of 1⅛-inch pitch and ¾-inch width. The heavy side chains are guaranteed to stand a strain of 60,000 pounds each, and the makers claim that one set will give good service for at least two years. All gear changes are obtained by a single lever at the right of driver's seat. The emergency brake lever is equally accessible. Clutch and running brakes are operated by foot pedals. To simplify gear changes the clutch and propeller shaft are automatically braked on the operation of the foot clutch or the emergency lever. Security is assured by five brakes, one set on the rear hubs, one set on the jack shaft and one brake on the clutch. Steering is of the worm and nut type. Front and rear axles have ample strength above the heaviest load capacity of the vehicle. The rear axle is of solid steel, 2 1-2 inches square, with integral spring seats. Roller bearings are used for the road wheels and for the steering knuckles. Tire dimensions are 36 inches by 5 inches in front and 3½-inch twins in the rear. Wheelbase is 108 and tread 60 inches.



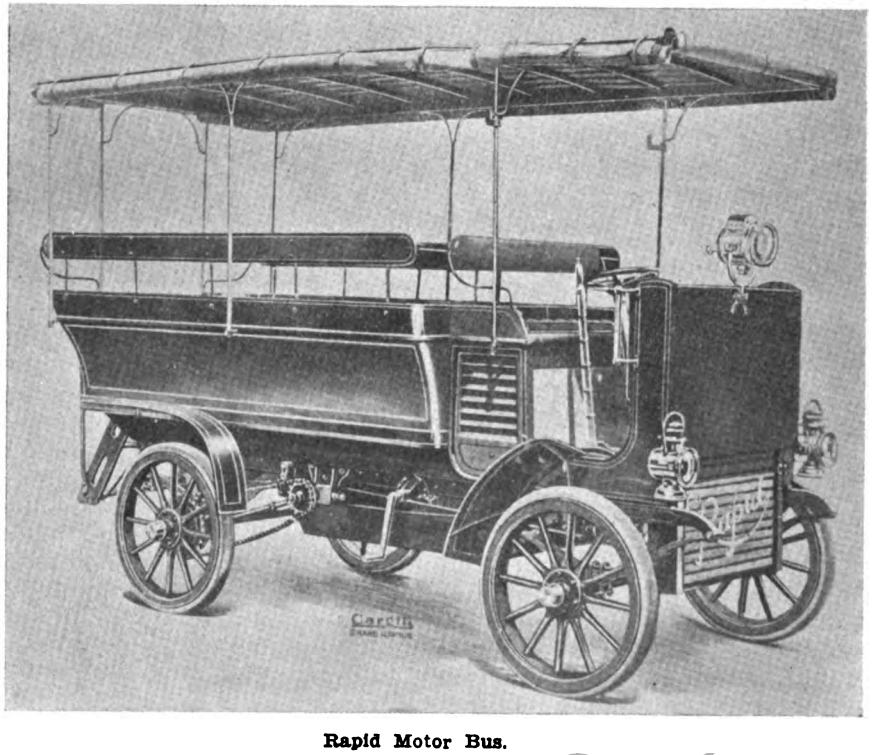
The Logan Three-ton Truck Transmission and Jackshaft.

Rapid Company's Exhibit

The Rapid Motor Vehicle Company, of Pontiac, Mich., showed ten models. This exhibit was the largest of its kind ever seen in this country. The models displayed embraced delivery wagons, trucks, sightseeing cars, opera buses, wagonettes, police patrols and telephone company emergency cars. The list comprises only a part of the Rapid company's product, but they supplemented it by a collection of photographs and specifications of their other models in actual service. The 1908 Rapid chassis is a good example of fool proof mechanism The 30 hp. motor is a double opposed, four cycle type of the original Rapid design, and is forced water cooled. Access to all engine parts, cylinder contents, etc., is obtained by simply raising crank case cover, which operation also permits all valves and valve cages to be removed by unscrewing one nut on each. The crank shaft is chrome nickel steel running on wide bronze bearings. Roller bearings are used in wheels and jack shaft. Every part of the Rapid chassis, with the exception of tires, roller bearings, carburetor, chains and accessories of that character, are made from raw material, on jigs and templates, in the Rapids factory, which permits of a most thorough inspection of both material and every stage of construction. The transmission is of the well known planetary type, altered sufficiently to conform with the policy of giving ample strength in every part. The gears are of 8-10 pitch, with a 1 1-4 inch surface, which is sufficient for a chassis of twice the capacity. The transmission is so situated beside the engine in the center of the frame that the weight is



Reliance Two-ton Truck.



Rapid Motor Bus.

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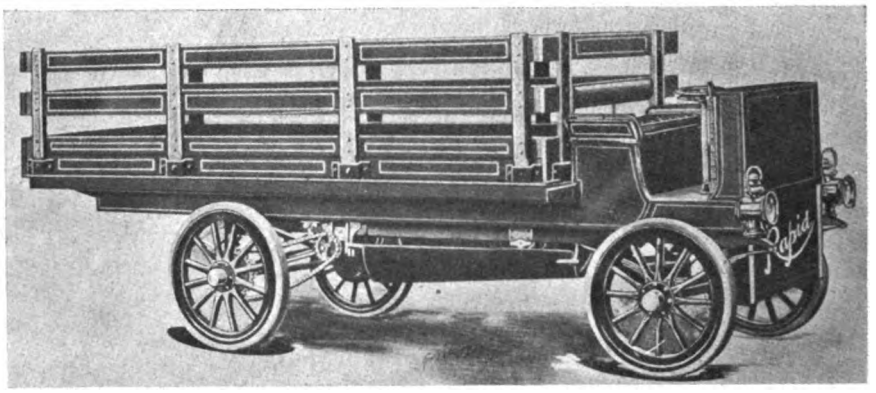
evenly distributed. This permits all vital parts to get the fullest benefit from the springs in lessening the vibration on rough roads. Pistons and all friction bearings are constantly lubricated by a positive driven oiler, the amount necessary for each determining the supply. A double side roller chain drive is used, the differential being in the jack shaft. The smooth running resulting from the sprockets being made in pairs and on a gear shaper fully justifies the extra work. The tires are solid endless rubber, 3 1-2 inches in width. The two speeds forward and reverse are controlled by two foot pedals and one high speed lever, which also supplies the internal hub brakes with one movement.

The Rapid company operates its own body plant, performing every operation from the seasoning of the timber to applying the fifteen to twenty coats of paints and varnish on every vehicle. A complete wood working building, recently erected, has facilities for constructing any design of body desired for any service.

The company makes two types of chassis, one for one-ton wagons and one for wagons rated at 3,000 pounds. The former is fitted with a 24 hp. engine, and the latter with a 30 hp. engine.



Rapid 3,000 Pound Truck.

Mack Bros. Company's Exhibit

The Mack Bros. Motor Car Company, of Allentown, Pa., exhibited a 22 passenger motor bus, a 20 passenger cross seat bus and a 5-ton truck.

A 50 hp. engine operates the 5-ton truck. Ignition is by high tension magneto and dry batteries. The lubrication is force feed, gear driven. The clutch is of the conical type, fibre lined. The change gear is of the individual clutch type, selective. The vehicle has 3 forward speeds. It is double chain driven. The front and rear wheels are fitted with taper rolling bearings, the transmission with annular ball bearings. High grade steels are used wherever their service is indicated. The wheel base varies from 120 to 168 inches according to service, the gauge from 66 to 72 inches. The front wheels are fitted with 6 inch solid tires and the rear with 4 inch twin tires. There is one emergency brake on each rear hub and two on the countershaft. Double sweep springs are employed.

Both motor busses are fitted with engines of 50 hp., having 5 1-2 inch bore and 6 inch stroke. Ignition, lubrication, clutch, change gear, speeds, drive and bearings are all of the same character as in the 5-ton truck. The wheel base of the 22 passenger bus is 168 inches, that of the 20 passenger bus 156 inches. The tread of the larger machine is 72 inches, that of the smaller 66 inches. The front tires of the large bus are of 6 inch diameter, those of the 20 passenger bus 5 inch. The rear tires of the large bus are 4 inch twins, 3 1-2 inch twins being fitted to the smaller machine. Brakes, suspension, valve arrangement and cooling are alike in both bus models.

SELF PROPELLED STREET SWEEPER

FRANCIS M. Pittman, of Logansport, Ind., is the inventor of a self-propelled street sweeper which is designed to sweep a path from eight to ten feet wide and raise the sweepings to a dust receiver holding a cubic yard. It is provided with a dumping mechanism and a sprinkling apparatus which will throw a light spray the width of the broom when the street is dry Provision is made for making light or heavy sweepings. All parts are controlled by the driver.

It is calculated that by the use of this machine the present cost of street cleaning can be decreased about 50 per cent. Three blocks of brick pavement, 60 feet wide, can be cleaned by Pittman's machine in about 30 minutes.

MOTORCYCLES IN LOS ANGELES MAIL SERVICE

FRESH experiments in light motor mail collection are being made by the postal department in Los Angeles. Motorcycles are used to make collections from boxes. The streets are well kept and level. Each of the little vehicles is provided with a large collecting sack suspended above and between the two front wheels. During three months of trial two such motorcycles, each driven by one man, have done the work of three men and three one-horse wagons.

CENSUS OF LONDON MOTOR BUSES

EVERY two weeks a count is made of the number of motor buses in service in London. At the last census taken the total of machines in service was recorded at 907, distributed as follows:

Vanguard Motor Bus Company	366
London Road Car Company	205
London General Omnibus Company	197
Great Eastern Motor Omnibus Company	55
Thomas Tilling	34
Miscellaneous owners	50
Total	907

Of these vehicles 428 are British made and 479 of European manufacture.

On a Swiss motor bus line each driver is to be provided with a portable telephone outfit, so that in case of mishap which he cannot repair he may connect his instrument to the line running along the road and summon help from the garage.

The Havana Auto Cab Company, with capital stock of $10,000, has been organized in Canton, Ohio.

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THE CHICAGO SHOW

WHEN the doors of the Chicago exhibition of commercial motor vehicles are opened on the last day of this month there will be seen the first representative display of the elements which compose this industry. Unlike other automobile shows, which are mixed in character and in which pleasure cars vastly predominate, this one will contain nothing but business machines, their appurtenances and equipment.

Visitors will not be drawn to the Seventh Regiment armory out of mere idle curiosity. They will be recruited from a class far different from that which is usually attracted by a mass display of automobiles. Executives and traffic superintendents of big mercantile houses, representatives of large and small express companies, the agents of transfer companies, and a well chosen body of people whose business is in greater or less part affected by the methods employed for carrying, will constitute the bulk of the attendance Thousands of invitations have been sent out by the management of the show and by exhibitors to responsible heads of concerns which are likely to be benefited by the substitution of motor haulage for draft animal transportation.

The list of exhibitors, which will doubtless be augmented before the show opens, up to October 23 was as follows:

H. H. Franklin Mfg. Co., Syracuse, N. Y.
Buckeye Mfg. Co., Anderson, Ind.
Rapid Motor Vehicle Co., Pontiac, Mich.
White Company, Cleveland, Ohio.
Commercial Motor Truck Co., Plymouth, O.
Sayers & Scoville, Cincinnati, O.
General Vehicle Co., New York, B'dway & 62d.
Logan Construction Co., Chillicothe, Ohio.
Reliance Motor Car Co., Detroit, Mich.
Gifford-Pettit Mfg. Co., Chicago, 720 Devon Ave.
Oscar Lear Automobile Co., Springfield, O.
Studebaker Automobile Co., South Bend, Ind.
Pope Motor Car Co., Hartford, Conn.
Mitchell Motor Co., Racine, Wis.
Couple Gear Freight Wheel Co., Grand Rapids, Mich.
Knox Automobile Co., Springfield, Mass.
A. D. Meiselbach Motor Wagon Co., N. Milwaukee. Wis.
Safir Automobile Co., Zurich, Switzerland.
American Motor Truck Co., Lockport, N. Y.
Brush Runabout Co., Detroit, Mich.
Streator Motor Car Co., Streator, Ill.
Coppock Motor Car Co., Marion, Ind.
Worth Motor Car Co., Evansville, Ind.
Advance Mfg. Co., Chicago.
The Hartford Rubber Works Co., Hartford, Conn.
Firestone Tire & Rubber Co., Akron, O.
Morgan & Wright, Detroit, Mich.
The Diamond Rubber Co., Akron, O.
Indestructible Steel Wheel Co, Chicago.
Timken Roller Bearing Co., Canton, O.
Hartford Auto Parts Co., Hartford, Conn.
The Goodyear Tire & Rubber Co., Akron, O.
The Automobile Utilities Co., Boston, Mass.

From this list it will be observed that there is a wide expression of the genius of the industry so far as appertains to the building of commercial motor vehicles.

Correspondence

French Motor Cabs in America

To the Editor: It strikes me as singular that companies formed to operate motor cabs in this country should deem it good judgment to buy any part of their equipment abroad.

Some years ago, when the American industry was in process of formation, our market was temporarily open to invasion and French products, though costing twice as much as they could be bought for at home, were sold here with comparative freedom to people who were more blessed with wealth than discretion. For a short time the patronage of these moneyed aristocrats gave a certain prestige to French design which much of it did not deserve. The progress in American automobile engineering, however, soon checked the growth of this sentiment, and today we find French exports to this country declining as rapidly as formerly they had mounted. During the past eight months their value has shrunk 20 per cent, or $446,000.

Bear in mind that this shrinkage represents the loss on trading in the very best class of French products, namely, high priced touring cars.

Now is there any reason to suppose that the French can sell us better light machines than we are producing? Or is there any likelihood that they can sell us more than a few at twice the price for which we ourselves can sell them? French motor cabs are only converted light touring cars. They are not strictly designed for the service expected of them. Therefore, it strikes me that in selling such vehicles to our operating cab companies the French are handing us a lemon of the yellowest hue.

J. C. WHITMAN.

New York City.

Low Monthly Maintenance Cost

To the Editor.—I have just asked our bookkeeper to give me the total expense on our electric wagons to date—one of which has been in service for three years and two for two and one half years, which would be equivalent to 96 months for one wagon. The total cost has been $2,304 or exactly $24 per month. This includes a renewal of all batteries and an extra set on hand. This would seem very satisfactory to me, as our wagons do hard work seven days each week and are in good running order today, carrying from 500 to 1,000 pounds, average load 700.

A Pittsburg Owner.

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The First Night's Lodging Place.

Long Test of Reliability

Trials Lasting Five Weeks During Which Time Motor Wagons Were Severely Tested

SO far as it is possible for public trials to demonstrate the service worth of industrial motor vehicles, or indicate their potential economy, the five-week competitive event just concluded in England has, perhaps, more to its credit than any other preceding function of like character. It was conducted with rare administrative skill, was tolerably representative of the state of the industry and undeniably held the attention of thousands whose rudimentary thoughts upon the subject of mechanical road transport it was highly desirable to broaden and improve. It was a well sustained and dramatic attempt to mold a large mass of unformed public opinion and make it harmonize with expert views upon the somewhat intricate question of motor haulage.

The trials, which began September 9 and ended October 12, sent the 56 competing vehicles into every important industrial center of England. Fifty machines finished the long journey. All were not required to perform the same daily service, though all were parked in the same space at night.

* * *

Entry List and Mileage

The competing vehicles in the various classes were as follows:

CLASS 1—1,000 LBS.

Turgan Parcels Delivery Van.
De Dion Bouton Box Van.
10-12 hp. Darracq Delivery Van.
14-16 hp. Darracq Delivery Van.
"Thames" Delivery Van.
"Unic" Van.

CLASS 2—2,000 LBS.

Milnes-Daimler Box Van.
Straker-Squire Van with canvas tilt.
Lacre Box Van.
Straker-Squire Covered Van.
Palmer Tire "Thames" Van with "Palmer Cord" tires.
Lacre Box Van.

CLASS 3—3,000 LBS.

Halley Van.
"Siddeley" Van with canvas tilt.
"Siddeley" Post-office Mail Van.
Darracq-Serpollet Delivery Van.
Darracq-Serpollet Lorry.
Dennis Covered Van.
Thornycroft Lorry.

CLASS 4—4,000 LBS.

Halley Platform Lorry.
Straker-Squire Open Van.
Darracq-Serpollet Lorry.
Milnes-Daimler Box Van.
Milnes-Daimler Lorry.
"Churchill" Lorry with cab.
Dennis Covered Van.
"Churchill" Lorry.

CLASS 5—6,000 LBS.

Milnes-Daimler Tip Wagon.
Milnes-Daimler Pantechnicon.
"Hallford" Lorry.
"Siddeley" Brewer's Dray.

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"Siddeley" Tilt Wagon.
Straker-Squire Open Van.
Darracq-Serpollet Lorry.
Wolsley Petrol-Electric Lorry.
"Atkey-Gimson" Wagon.
Turgan Delivery Van.
De Dion Bouton Lorry.
"Churchill" Lorry with cab.
Maudslay Miller's Dray.
Dennis Covered Van.
Armstrong-Whitworth Delivery Van.
Commercial Cars Lorry.
"Thames" Lorry.
Thornycroft Lorry with rim sides.
Broom and Wade Paraffin Wagon.
Ryknield Covered Van.

CLASS 6—10,000 LBS.

Milnes-Daimler Railway Lorry.
Milnes-Daimler Brewer's Lorry.
Savage Flat Platform Steam Lorry.
Straker-Squire Steam Lorry.
St. Pancras Lorry with flat platform.
Yorkshire Patent Steam Lorry.
Dennis Open Lorry.
Ryknield Open Brewer's Lorry.
Fiat Brewer's Lorry.
Fiat Lorry with removable sides.

CLASS 7—12,000 LBS.

Burrell Steam Tractor.
Foster's "Wellington" Steam Tractor.
Tasker's "Little Giant" Steam Tractor.

The following table shows the total mileage covered by each class:

Class 1	1,540 Miles
Class 2	1,320 Miles
Class 3	1,210 Miles
Class 4	1,100 Miles
Class 5	880 Miles
Class 6	660 Miles
Class 7	660 Miles

* * *

Machines Dismantled and Inspected

At the conclusion of the trials the judges ordered all machines to be dismantled in order that an examination might be conducted which would enable them to determine which vehicles were entitled to certificates of merit. From this examination the judges are expected to report concerning the costs of operation of the various competing vehicles. In making up these costs the following things will be considered: cost per ton mile, repairs and adjustments, accessibility, adhesion, brakes, suspension, steering apparatus, ease of maneuvering, hill-climbing ability, ease of manipulation, finish of workmanship, and condition of vehicle after competition. The judges' report will, it is expected, appear in the next issue of this paper.

The physical examination of the machines at the end of the journey was not a perfunctory exercise. However excellent the road performances might have been, they could not, independent of other evidences, be depended upon to denote how machines which finished with credit would behave in subsequent service. The conditions of examinations, therefore, prescribed that engine cylinders be removed and all working parts dismantled; that leather and other covering for steering gear be taken off without loosening, removal or adjustment of parts; that the gear box be taken off and all oil removed; that clutches be cleaned; that differential gear casing coverings be taken off, the oil removed and the mechanism exposed; that chains be stripped; that one rear and one front wheel be removed; and that all parts subject to wear be thoroughly cleaned, washed with paraffine and wiped dry in order that the effects of the journey could be accurately noted. With all these preparations for examination made, the judges were in position to note signs of undue wear, any tendency to distortion, evidences of incipient fracture, the consequences of excessive vibration, symptoms of internal corrosion, and in general pass upon the accessibility or inaccessibility of vital parts and the general worth of engineering design.

* * *

In the map which accompanies this article the route taken by the vehicles is very definitely shown. The start was made from London, the first direction of the intinerary being westward. One of the purposes of giving each class a different route each day was to avoid road congestion. Another object of this disposition was to afford greater opportunity for the public at large to see the vehicles at work than would be the case if they were all enfiladed in a single column. One hour each day was set aside for fuel, lubricating oil and water replenishment, and adjustment and repair of parts. This interval of rest was granted as concession to normal needs, it being obvious that if the

Light Wagons Starting on First Day.

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trials were to be regarded as in any way approximating regular commercial service at least that much time daily would be required in order to keep the machines in good running order.

* * *

Repairs Permitted Under Penalty

It was not thought wise, or even necessary, to seal any of the parts of the competing vehicles. In this respect the contest was in marked contrast to the French trials recently held, and in which trifling mechanical derangements, which in normal commercial practice would have been readily rectified, acted to disqualify many of the vehicles Those who organized the English trials reasoned that to forbid roadside repairs would work injustice to machines which could hardly be expected to be superior to mishandling. In permitting repairs, however, they did not forego the right to penalize for such privileges. Time spent in effecting repairs was noted by an official observer placed on each wagon and entered on a score card by him, appearing later in the record sheets of the higher officials as demerit marks against the performance of the various machines. Time was also allowed for washing and removing the evidence of continuous road travel which, if permitted to remain, might seriously interfere with the efficiency of the vehicles. All vehicles went into action at seven o'clock each morning and were safely harbored by five o'clock in the evening.

* * *

What the Trials Cannot Determine

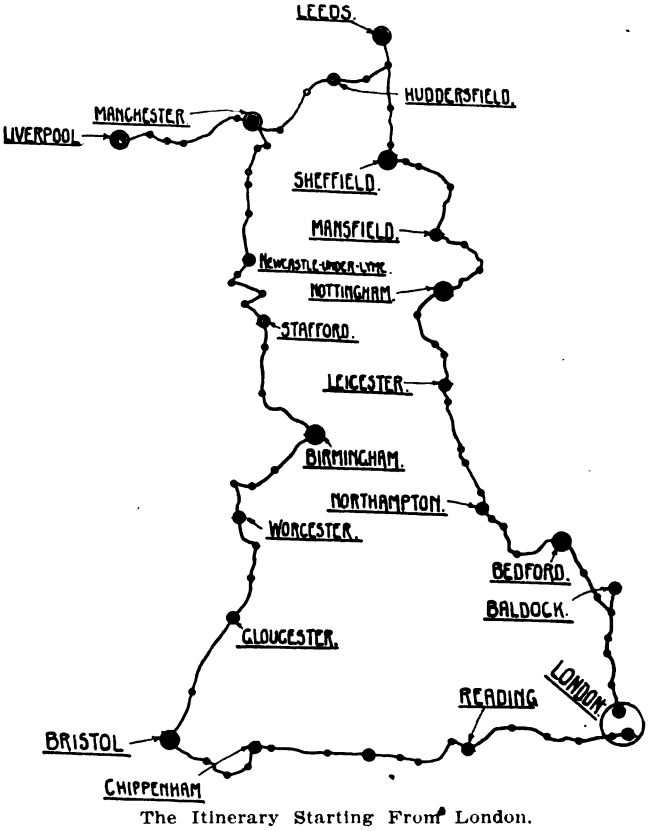
If the permanent reliability of a motor wagon may be determined by its ability to remain in constant service for five weeks operating at speeds in many cases considerably lower than would be required in actual service, and traveling over highways which are not a measure of city service, then the results of the trials, so far as can be ascertained at this moment, prove that the demonstration was a success. Very grave doubt exists, however, if such trials produce anything more substantial than advertisement for the participants and the education of the buying public with respect to the possibilities of motor wagon haulage. It is impossible to see how the judges' award can finally determine the relative value of the competing machines from such evidence as road behaviour and subsequent physical examination after dismantlement afforded. It has happened upon more than one occasion that motor vehicles of very inferior mechanical design have acquitted themselves with great credit in trials of this kind. The only true test is to be found in service extending over a long period of years. Defects in construction do not always appear in a month's trial, and sometimes not in a year's service. In view of this it will be interesting to observe what the judges have to say at the time they make their decisions public. In dealing with such matters as brake efficiency, control, fuel economy, etc., the judges probably have enough evidence before them to decide wisely. It must not be understood, however, that whatever announcements they may make with respect to such matters will represent the last word which might be spoken as few of the competing vehicles are loaded to their full capacity, a condition made necessary by the nature of the itinerary, which at times was unusually severe. Fuel plays a much more important part in the economy of motor wagons in Great Britain and Europe than it does here. Gasoline, which in our country costs but 12 cents a gallon wholesale, in London cost 35 cents and in Paris about 50 cents. To some extent the popularity of the steam vehicle abroad is sustained by the high cost of gasoline.

* * *

Interest in Steam Vehicle Performances

Of the 56 machines which left London at the beginning of the trials, 53 were motor wagons and 3 tractors. Of these 38 were of British manufacture, 11 of French and 7 of German origin. Wagons operated by internal combustion engines numbered 44, 11 were steamers and one was of the gasoline-electric variety. Three of the machines driven by gas engines used petroleum as fuel. The performance of the steam machines was watched with more than ordinary interest. The large number of these machines, carrying loads of 5 tons, which have served British mercantile interests for six or seven years past, was sufficient to arouse curiosity to know how they would behave in competition with gasoline vehicles of equal capacity. The tractors, all of which were operated by steam, from start to finish seemed to perform their work with remarkable ease. One, in descending a steep hill, was overthrown, its trailer overrunning the engine in front owing to insufficient brake power on the former. The damaged tractor and trailer, however, were soon repaired and continued the journey.

The tractors hauled only 75 per cent of the 8-ton loads which their makers expect them to haul in regular



The Itinerary Starting From London.

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service. The loads on the vehicles of the other classes were nearer to those which they might be expected to carry in regular commercial duty.

* * *

Speed was Below Commercial Average

The daily mileage prescribed for the vehicles in each class was on the average considerably below what would be required of them in commercial life. While a legal speed of 20 miles an hour was permitted wagons of half-ton rating, the managers of the trials limited the entries in this class to a speed of 9 miles an hour, which naturally led to the machines using more fuel per mile than would be the case if they had been speeded a little faster. This was also the case with the steam tractors.

Fearing that the publication of the official results of the trials would not do full justice to the worth of the machines in service, a lecturer who accompanied the vehicles on their long journey took occasion to point out that this underloading and underspeeding would be apt to give the public false impressions regarding the economy of various machines. To offset any misapprehension concerning the economy of the vehicles in the various classes, attention was drawn to the average of working costs, based upon the experience of many users, and including such charges as interest, depreciation, wages, fuel supplies, repairs, insurance and sundries. It was shown that the average per vehicle mile operating cost of a 1,000-pound wagon, making (400 miles a week, was 6.14 cents; of a one-ton wagon making 400 miles a week, 8.4 cents per vehicle mile; of 1½ ton wagon making 400 miles a week, 8.14 cents per vehicle mile; of a 2-ton wagon, making 350 miles a week, 10.16 cents per vehicle mile; of a 3-ton wagon, making 300 miles a week, 15.7 cents per vehicle mile; of a 5-ton gasoline wagon, making 260 miles a week, 26.2 cents per vehicle mile; of a steam 5-ton wagon, making 200 miles a week, 18.6 cents per vehicle mile; and of a 6-ton tractor, pulling 6 tons being the drawbar and making 200 miles a week, 16.4 cents per mile.

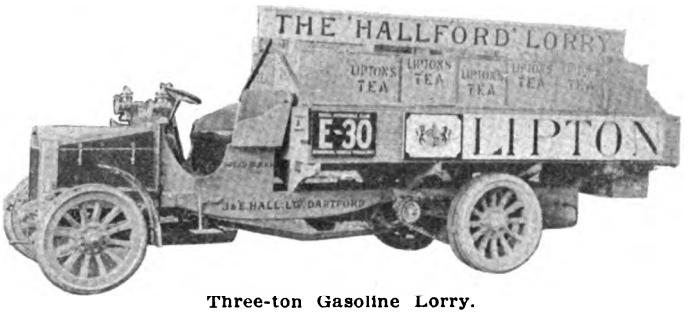
* * *

Lifelike Loads

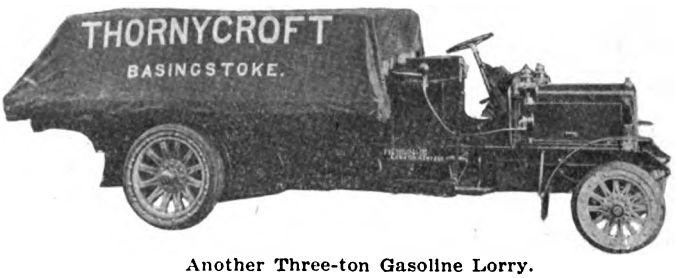
The variety of loads carried by the competing vehicles was not the least interesting feature of the trials. It was evidently the intention of the promoters to give such assurance as was possible to the buying public that motor wagons are capable of hauling any form of merchandise. A number of machines were loaded with pig iron, others carried wood, furniture and many of the common commodities of commerce. This was a departure from previous practice which deserves to be permanently incorporated in the conduct of trials. The more lifelike the loads the more interest the vehicles carrying them are sure to arouse. Past practice in this respect has been to load competing vehicles with bags of sand, thereby implying that there was no gain or loss to be anticipated from the carrying of live or dead, light or heavy merchandise.

It must be confessed that so far as the weather conditions were concerned the machines had luck on their side. The roads were in splendid condition. The absence of rain and heavy roads naturally prevented a thorough test

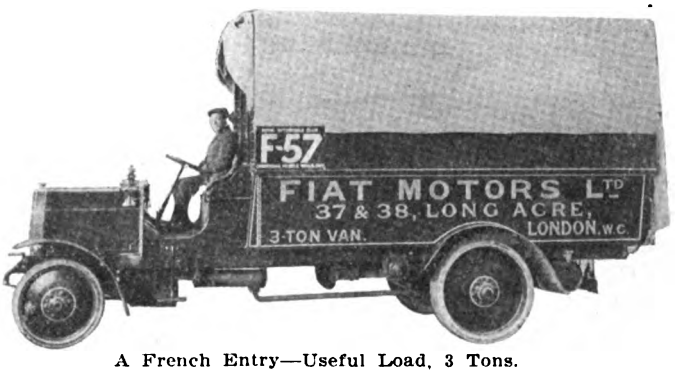
Two-ton Darracq-Serpollett Steam Wagon.



Three-ton Gasoline Lorry.



Another Three-ton Gasoline Lorry.



A French Entry—Useful Load, 3 Tons.

Three Ton Wagon Using Paraffin for Fuel

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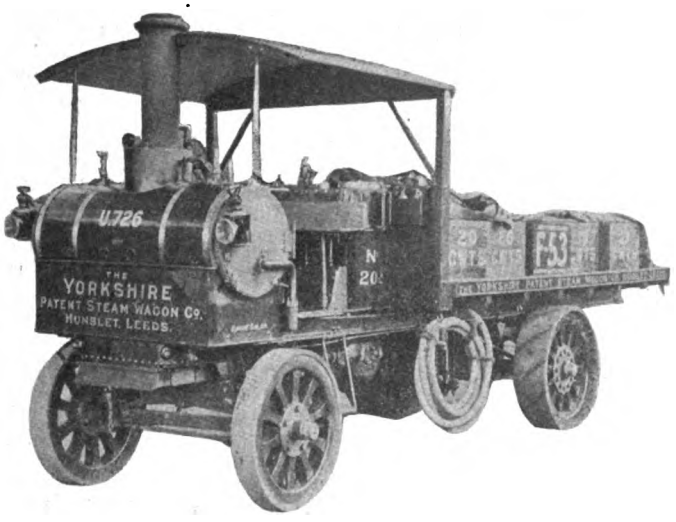

Five-ton Steam Lorry.

of the vehicles under adverse conditions. Much regret was expressed on this account, as it was the desire of all participants to show what their entries could do when the conditions were very unfavorable as well as when they were extremely favorable.

* * *

Solid Steel and Pneumatic Tires

Solid rubber tires, plain and straked steel tires, steel tires fitted with wooden treads, and pneumatic tires with steel studded casings, were all under close observation. Many of the solid tires were heavily overloaded; that is to say, their cross diameters were too narrow for the rating of the vehicles to which they were fitted. If it should appear that demerit marks were entered against machines so inadequately shod, blame for the excessive wear will hardly be imputed to the tiremaker since the equipment of the vehicle is seldom left to his judgment. There is a marked tendency, both here and abroad, to under-equip wheels of motor wagons at the factory. This is usually due to two causes; one, a not unnatural ignorance of the actual service in which the wagon is to be employed, and, the other, a disinclination on the part of the vehicle manufacturer and user to invest any more money for tire-equipment than will permit the machine to perform the commonest duty. Gradually, however, it is being realized by both vehicle maker and vehicle owner that generous tire dimensions constitute a first-class form of insurance, cushioning the load, saving wear and tear on the machinery, lessening the number of interruptions to service where spare tires are not carried, and, on the whole costing less for up-keep.

Comparing the work of rubber tired vehicles in the trials with those which traveled on steel wheels, the former seem to have had the advantage in the matter of traction. Of course, a comparison is only possible between vehicles of the heaviest kind, since all light load motor vehicles are invariably equipped with rubber tires. Wet macadam and limestone surfaces did not afford as good traction for rubber tired wheels as they did for steel wheels, which seemed to bite better under such conditions. On the other hand, the steel tired heavy wagons did not do as well as rubber tired heavy service machines over granite pavements, which was in the least out of level. The drivers of steel tired wagons and tractors did not consider it anything out of the ordinary to be compelled to place sand, pieces of cloth, coke, or whatever material was handy, in the path of the driving wheels when slight grades had to be mounted. Further than this, the steel tires slipped as did the rubber tires, and with fully as much frequency under all conditions of service.

A one-ton French gasoline wagon fitted with steel studded pneumatic tires had an experience which effectually quieted the pretensions of its makers to a claim upon public notice for the value of such a tractive device. Its rear tires, measuring 36 x 6 inches, not only took may hours to fit, but caused many demerit marks to be charged against the machine, which eventually was withdrawn. One of these tires burst and scattered its retaining flange and bolts all over the face of nature.

Tractor steel wheels fitted with wooden treads helped their heavy duty vehicles very materially when climbing stone paved gradients, but such equipment was not enough to prevent slippage when the same grades were covered with slime. Wooden treads on steel wheels are not, as some imagine, necessary for all forms of heavy traction. In many cases they are superfluous. When, however, their use is indicated they are found economical, notwithstanding the extra cost of such equipment. Wooden treads on steel wheels of heavy vehicles can be used at a cost of about two cents per vehicle mile if the weather conditions are favorable. In wet weather this cost is certain to be exceeded. Composite and rubber treads may also be used with advantage on steel wheels in heavy vehicle service, their employment largely being indicated by the nature of the work to be performed and the degree of gross economy there is in accomplishing it by means of the motor wagon.

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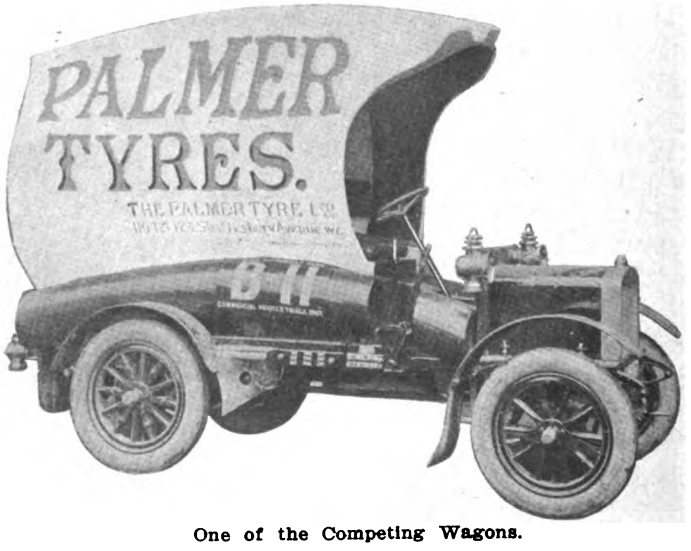
Wheel Base and Track

From the variety of wagons entered in this competition one was enabled to form some idea of the attitude of British constructors with regard to the accommodation of loads to be carried. Until recent times the impression



One of the Competing Wagons.

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was general that the lengthening of the wheel base, with its inevitable overhang of body, was the most convenient means for carrying bulky or much merchandise. The overhanging body, however, causes heavier wear on tires than is the case when the wheel base is lengthened. It also is a menace to vehicle traffic in crowded streets, especially in rounding corners and when skidding occurs. But as to lengthen the wheel base to correspond with the load carried would in many cases weaken the frame construction unless it was heavily re-inforced, it is now a rather prevalent custom to increase platform width while shortening the carrying area and generally giving the vehicle the stubby appearance which characterizes one or two light American models of recent design. In doing this the track width is not increased, the broadest of the light duty machines being 4 feet 7 1-2 inches to an 8 feet 3 inch wheel base. There are, of course, some examples of narrow gauge, one of the light trial vehicles having a 3 feet 10 1-2 inch track to an 8 feet 9 inch base. One machine in the 1 1-2 ton class had its front wheel track seven inches narrower than its rear track. It was only six feet high. Its wheel base was 10 feet 10 inches. The narrowest gauge in the one-ton class was 4 1-2 feet. In the 1 1-2 ton class the machines that were highest from the ground had the shortest bases, 9 3-4 feet. The minimum track in the 2-ton class was 4 feet 9 inches and the maximum 5 feet 11inches. In this class also two machines showed varying front and rear tracks, one having a five-inch variation and the other a variation of four inches. The highest machine in the trials measured 12 1-2 feet. Its wheel base was 15 feet 3 inches. Its front gauge was 5 feet 10 inches and its rear gauge 6 feet 2 1-2 inches. Its load was three tons. Seven of the ten entries in the 5-ton class had narrower front than rear tracks. The wheel bases and tracks of the steam tractors, which machines weighed over 6 tons, were no longer nor wider than those of the half-ton wagons. Their center of gravity was high, indicating great instability.

* * *

Non-stop Performances

By the time the machines had reached Manchester 52 of the 56 original entries were on hand for the journey to Liverpool, and it was striking testimony to their reliability that 49 of them reached the latter city without making a single stop for any cause whatsoever. It was very instructive to observe how, as the trials progressed and the nervousness of drivers wore away, the number of machines which performed their daily tasks without involuntary stoppages began to increase. Many of the early troubles were due to the fact that a number of machines were not broken-in before being started in the contest. In several cases they went into the trials straight from the shop. Motor wagon builders seldom have a surplus of finished product on hand, and they are fortunate if they can spare a demonstrating machine, which is generally in prime condition, for a competitive engagement.

* * *

Hill Climbing Capacity

A tolerably accurate idea of the diversity of the service conditions of the trials may be formed by remembering that, though the weather was propitious, the roads selected for travel were well calculated to test both vehicle design and equipment. If there were plenty of stretches of fine level surfaces there were also many bumpy and hilly miles to be covered, especially when the demonstrating caravans reached Lancashire, Yorkshire and the north. Here the steel tired steamers performed with great credit. One stretch of roadway rising 600 feet in 3 miles, and another rising 480 feet in 2 1-4 miles, taxed all the power of all the machines. To the surprise of the natives of these regions, who are accustomed to see three horses take a day to pull two-ton loads up and a little beyond these grades, no motor vehicles showed signs of flagging in making the ascent even when carrying 5 tons and over. The hill climbing capacity of the machines was a very noteworthy feature of the trials and naturally excited the liveliest interest among the populace.

* * *

Brake Tests

The hills gave opportunity for making surprise brake tests. Occasionally distances were staked, machines were flagged and results recorded. In these tests the steam wagons and tractors were proven to be equipped with too much brake power when the engine was used as brake, the skidding of the principal driving wheel permitting the other driving wheel to free in the differential, with the result that sideslip was of frequent occurrence. On the other hand, many of the gasoline machines were found to be under equipped with brake power. Upon one occasion a surprise brake test was made at the top of a hill having an average grade of 1 in 9 and a pitch of 1 in 7 at the summit. Each vehicle was started separately and timed to a selected stopping-place near the top, from which the machine was allowed to run back a distance of 30 feet before application of the brakes. The great majority of the wagons and tractors mounted the grade in good style. Two machines had to climb the hill in their reverse gears, while a third had to discharge one ton of its load before ascending in its reverse gear.

* * *

Accidents and Withdrawals

Two vehicles retired from the contest in the first week. A 5-ton lorry collided with and derailed a street car, but was itself practically unharmed, continuing its journey. This is interesting proof of the strength of the road machine. Of the two withdrawals mentioned one was caused by too high gearing and the other because the 15 hp. engine was not powerful enough to transport a 3-ton load. Bad driving and poor adjustment caused the retirement of one machine in the second week. Another machine was withdrawn because of unsatisfactory service afforded by its steel studded pneumatic tires. Clutch shaft and gear box troubles caused the retirement of another. Three machines were disqualified.

A number of motor wagons have been purchased by the Austrian military authorities.

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CONSIDERING MOTOR WAGON MANUFACTURE

WORD comes from Marion, Ind., that Thomas F. Hart and J. Madison Maring are maturing plans for the erection of a factory in which motor wagons will be constructed. Mr. Hart was vice-president of the American Window Glass Company at one time His associate also was connected with the glass making industry.

The Seitz Automobile & Transmission Co. will soon erect a factory at Monroe, Mich., for the manufacture of friction gear motor trucks. The city council of Monroe has voted a free site for the concern, as well as other financial assistance. The invention which will be developed is that of William J. Seitz, of Grape, Mich., and is a double friction transmission with a changing speed ratio and quick reverse gear. The company has been capitalized at $500,000, sufficient of which has been paid in to meet the present requirements of the concern.

The chief of the volunteer automobile corps at the grand maneuvers of the German army, in his report, recently published in Berlin, says that after a three years' trial he is convinced that the automobile is an absolute necessity with an army in active service.

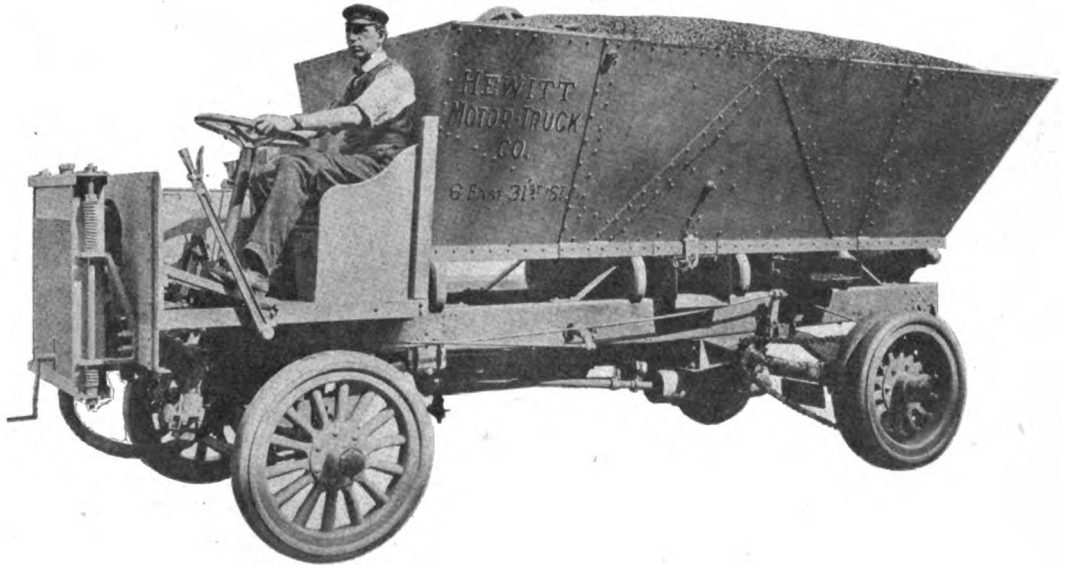
A motor bus line now connects Plainfield, N. J., with South Plainfield, six miles distant.

SPRING WHEELS

SPRING wheels of the type usually designed to aid in cushioning load do not appeal to motor wagon constructors either in this country or abroad on account of the difficulty encountered in keeping their springs tensioned to the duty expected of them. Hence automobile engineers have come to regard such devices as makeshifts.

The resilience of the springs in spring wheels diminishes soon after they are put in service. One spring develops less strength than its fellows, thus causing unequal suspension throughout the wheel. Often the springs become rusty and so lose their original tension. Another difficulty with spring wheels has been the maintenance of lateral and circumferential or longitudinal rigidity in practical work. Of all the many forms of spring wheel designs which have been invented, only those in which the springs form a part of the tire periphery claim any serious attention. There is always the circumferential stress of the power-driven wheel to consider. In other words the power of propulsion must pass through the tire's periphery before the vehicle can move, and this stress of power is enormous in the case of very heavy motor wagons.

Passadena, Cal., is to be provided with a motor driven chemical engine.



Five Ton Coal Carrying Truck

THE construction of the Hewitt Motor Company's five ton truck, shown in the above illustration, indicates that it will successfully withstand the severe service to which vehicles of this class are customarily subjected. In the illustration the chassis is shown fitted with a side delivery coal body having a false bottom. The load is removed by attaching an auxiliary chute and opening the gate. The load shown in the photograph amounted to 12,400 pounds. The frame, springs, chains, steering apparatus and other parts of the chassis are proportioned for heavy duty. Loaded, this coal truck travels at 8 miles an hour; empty, it may be speeded to 15 miles an hour. The motor, rated at 30 hp., is of the vertical four-cylinder type. The speed change gear is of the planetary type. The radiator is mounted on an independent spring suspension, by means of which it is relieved of the strains which are communicated to slow moving heavy vehicles. Two double brackets are bolted securely to the forward end of the main frame, each furnishing a vertical bearing for a guide and supporting rod which is mounted at either end of the radiator casing. A couple of helical springs, one above the upper arm and the other below the lower, serve to cushion the shocks, at the same time permitting the entire radiator to move vertically as required, without stressing any of its connections, and preventing that internal distortion which has proved so destructive to vehicles of this class. The wheels are 36 inches in diameter. The front are fitted with 5-inch tires and the rear with 4-inch twins. The driving sprocket is 24 inches in diameter. The wheel base is 138 inches, and the tread 68 inches.

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MOTOR CAB PROFITS

DURING six months of operation, ending with June, the Campagnie Generale des Automobiles Taximetres made a net profit of $20,000. The company has a large number of cabs "de luxe" on the streets, besides the ordinary "autotaxis." It has contracts with different hotels in Paris which insures very regular and remunerative activity for the former vehicles. Paris motor cab companies are little disposed to inform the public, or even their shareholders, of the net receipts obtained, but some consent to issue the average daily returns per vehicle. Experience has shown that from gross daily takings of $10 about 50 per cent should be deducted for general expenses, and that of the remaining $5 one-half should be taken as the net profit of the company. In quite recent times, however, when companies were issuing their prospectuses, a dividend of 15 per cent was foreshadowed on net receipts of $2 and even $1.75 per day.

BUS DRIVER BURNED TO DEATH

A motor bus driver who undertook to stop the flow of a leaky fuel pipe on a London vehicle was recently burned to death. The unfortunate man, who had been employed for thirteen months as a motor bus driver, made this ante-mortem statement: "One of the fuel supply cocks had broken off and the gasoline was flowing. I got underneath the vehicle and put my hand over the leak while my conductor went to procure a lamp in order that we might find a plug. I took the lamp from his hands, and, as I was soaked with gasoline, the result was disaster."

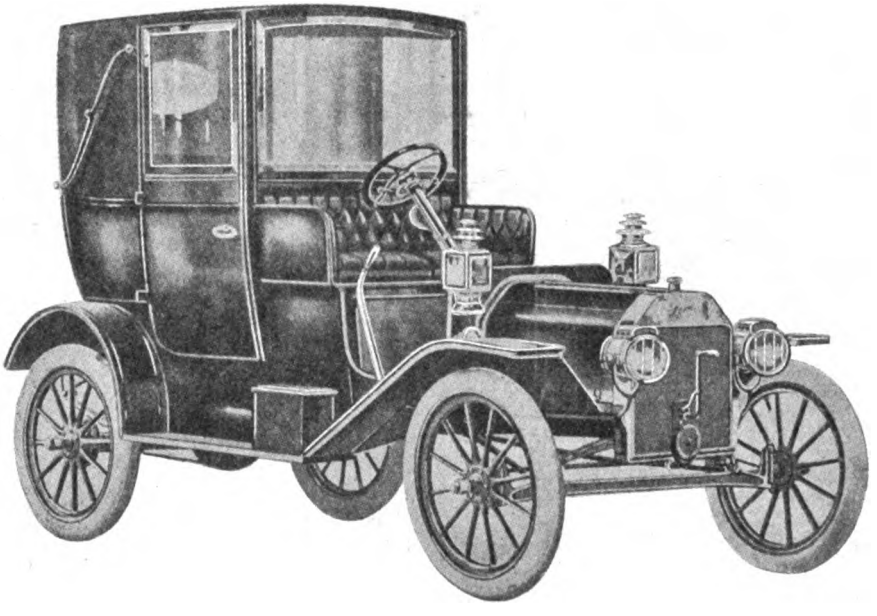
TEACHING DRIVERS ECONOMY

DRIVERS hired by one of the largest motor cab companies in London are given one-fourth of the fares they collect, the company taking the remainder and stabling the machines, as well as cleaning them. To guard against waste of fuel and the tendency to theft, the company does not provide gasoline, but sells it to the drivers at a nominal rate, also renting them headlights. Whenever tires show much wear the men are compelled to replace them, by which means economy of operation is enforced.

The $2,500,000 worth of insurance held on the cabs is divided among fifty-six companies, and the general restriction is enforced by the insurance concerns that none of the vehicles shall be driven by men who have had more than three accidents. When a driver has had his third mishap he is discharged, and since all other operating companies are insured to some extent in one or more of the same companies the result is that men with such a record are compelled to abandon the business or move to other parts.

Upon returning from work the ordinary maintenance of the vehicles, as already indicated, is looked after entirely by the company. That is to say, on returning from the day's work each cab is washed, inspected, and oiled, all that remains for the driver being to clean the brasses and the interior.

Sixty motor cabs are to be operated in Stockholm by a company comprised of French capitalists. French machines will be employed in the service.



A $1,000 Taximeter Cab

The production of a taximeter motor cab to sell complete at $1,000 has been announced by the Ford Motor Company, of Detroit. The vehicle, which is fitted with a four cylinder 20 hp. engine, is shaft driven, has a wheel base of 97 inches, is shod with 30 by 3½ inch tires, and weighs 1600 pounds, It is of the landaulet type. It is reported that 5,000 of these public service vehicles will be built next year for sale in London, Berlin, Paris and St. Petersburg. It is also rumored that 1,000 of them will be placed in New York City, arrangements to that effect having been concluded with a new company formed for the purpose of operating motor cabs in the metropolis. Vandium steel is freely used throughout the design wherever working stresses are great.

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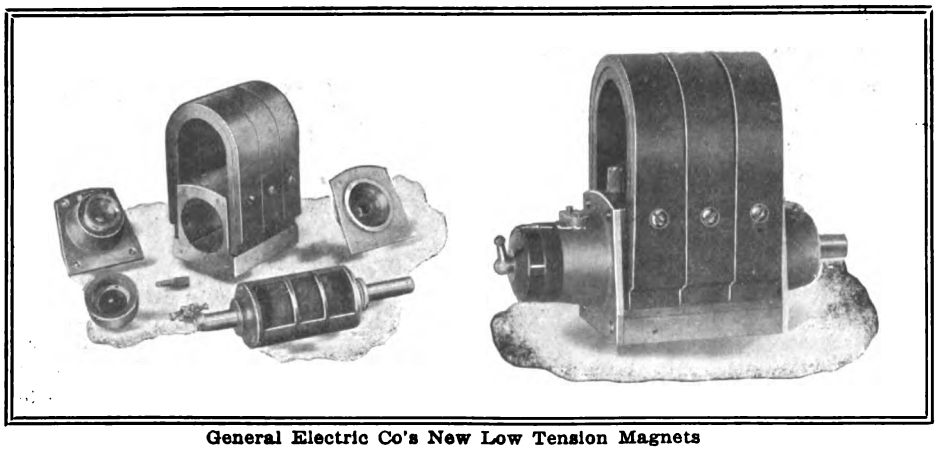
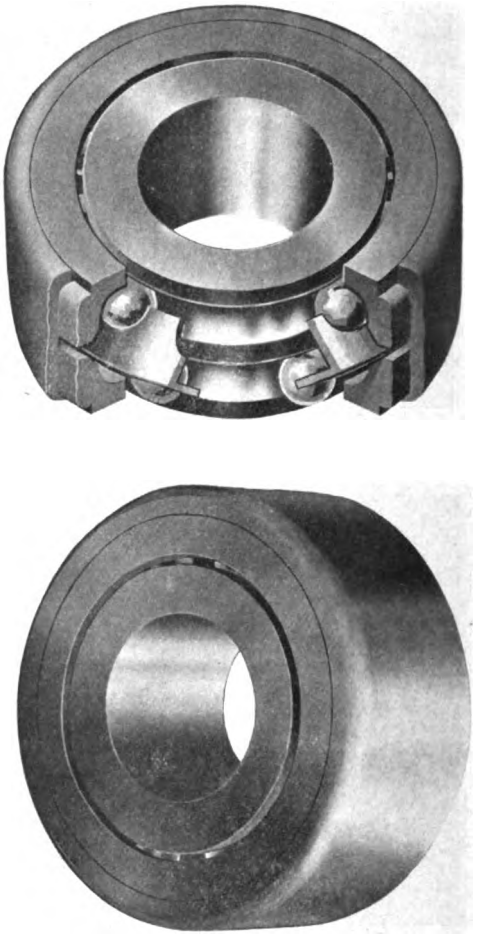
Information For Buyers

NEW LOW TENSION MAGNETO.—The General Electric Company has recently developed a magneto which embodies the most desirable features of construction as determined from its past experiences in other lines of work. This magneto is of the low tension type and differs mechanically in many respects from other machines on the market at the present time. The general construction is most substantial and without superfluous trimmings. Lubrication is effected by the use of waste packing in the same manner as has been successfully applied in connection with the company's automobile motors. Generous oil wells are provided with overflow holes to prevent excessive lubrication. The type of bearing used eliminates the small wick oiling device heretofore so often used, and insures the ample lubrication necessary for these machines. The oil wells are readily accessible, and when covers are in place are dust-proof and will operate for months without attention. Oil baffles are provided on both ends of the armature to prevent oil from working into the armature and interior parts of the magneto. Ample bearing surfaces are provided, as well as shaft of large diameter to insure strength, rigidity, and a minimum amount of wear. Both the base and bearings are of bronze and finished with a sand blast, which produces a very attractive appearance. Bronze has been found a more satisfactory metal than aluminum for this use, as it is less fragile, much more durable and looks cleaner after extended use. The general appearance of this magneto is shown in the accompanying illustration. A number of especially desirable features are noticeable in the construction of the armature. One end of the armature winding is brought out through the hollow shafting by means of a steel conductor. The insulation bushing between the shaft and this conductor is of bone, and is, therefore, little affected by moisture or light. The current is carried from the steel conductor by means of a phosphor bronze spiral spring to the lever nut which forms the outside terminal, thus avoiding loose contacts. A hard rubber cover screwed to the bearing carries the contact with all its parts. This cover is provided with a knurled exterior. The grounded side of the armature winding is firmly fastened to the core, and a carbon brush insures good contact between armature winding and frame or ground. The magnetos are of the double type, sprung on the frame and secured by one screw on each side, thus minimizing the detrimental effect of drilling the magnets. The long experience of the General Electric Company in producing millions of permanent magnets for meters and instruments has materially assisted in the production of permanent magnets for these magnetos. They are surpassed by no known product of this or any other country. The bearing being screwed to the top and base of the frame, rather than to the poles, results in minimum drilling of the pole pieces, thus further improving the properties of the magnets. The demagnetizing of the field magnets is prevented by avoiding a complete breakage of the permanent flux by making the armature core slightly overlap the pole gap when it is in a vertical position. The design of the armature allows generous insulation and also permits two other important advantages. With this magneto, an open circuit voltage of over 100 volts is easily obtained while a short circuit current of approximately 0.4 of an ampere is available. In order to secure this high short circuit current the resistance of the armature winding is as low as possible, while the number of turns is sufficiently high to give an adequate open circuit voltage.



General Electric Co's New Low Tension Magnets

ANNULAR BALL BEARING.—The annular ball bearing produced by the New Departure Bell Company, of Bristol, Conn., will be one of the interesting exhibits at the A. L. A. M. show in New York next month. President Albert F. Rockwell of that Company some time ago invented an annular ball bearing, with two rows of balls and two sets of ball races, designed to take a radial load and end thrust. The development of the bearing has been completely satisfactory. It has successfully withstood many severe tests at the factory and at the hands of automobile manufacturers. The new bearing is in reality two bearings in one, of exceptional strength and efficiency. It is guaranteed to take a radial load twice that of any other bearing of the same size, also an end thrust nearly equal to its radial load capacity. The bearing is a perfect substitute for the combined end thrust and radial load bearings at present used in most automobiles. Two rows of balls are employed and are designed to distribute the load evenly between them. The load is on a diagonal line from the vertical instead of radial. In such places as a bevel gear bearing, where the line of strain is at right angles with the base of the teeth on gear, the load is intermediate between the radial and end pressure and is taken care of to the best possible advantage, as will be seen in the accompanying illustration. The separator is designed to



New Annular Ball Bearing made by New Departure Bell Co.

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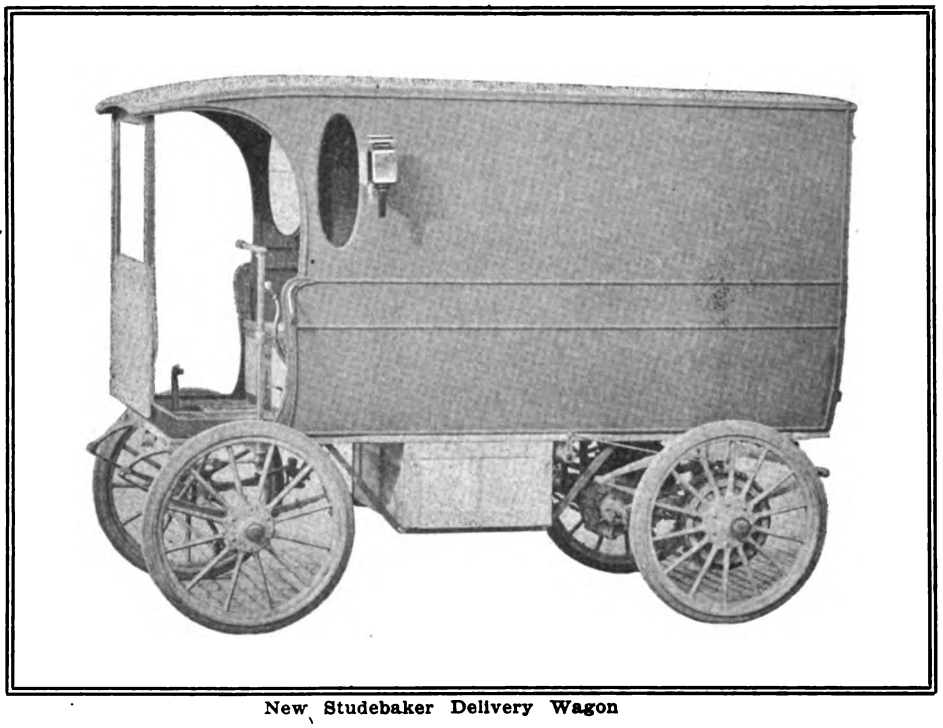
permit the largest number of balls possible and is supported by the rows of balls, without friction at any stationary point. The same high grade workmanship and materials entering into all New Departure products is found in the construction of this bearing. The bore and outside diameter are in standard measure. The balls are of the company's own special process of manufacture. The advantages claimed for the new beaaring are greater load carrying capacity, two rows of balls as against one, and the practicability of using a lighter type of bearing at a lower cost, but of load carrying capacity equal to that of the more expensive size of the ordinary radial type bearing.

JOINS PARTS DISTRIBUTING COMPANY.—On October 1, Charles G. McCutcheon was elected vice president of the American Distributing Company, of Cleveland. He will handle the eastern business of the firm.

CHASE COMPANY ACQUIRES A PLANT.—The Chase Motor Truck Company has acquired a plant for the enlarging of their business. The plant was formerly occupied by the Sweet Steel Co., and is located 310-334 S. West St., Syracuse, N. Y. The property covers ground area of 58,000 sq. ft. Besides the office there are the following buildings; the machine shop, four stories, 17,280 sq. ft. area; the erecting shop, one story, 15,750 sq. ft.; the pleasure car department, one story, 21,600 sq. ft. floor area. The manufacture of the Chase commercial cars will be pushed with the enlarged facilities, and a large number of machines marketed during the season of 07-08.



New Studebaker Delivery Wagon

NEW STUDEBAKER MODEL.—In this page is shown a picture of a new Studebaker Electric delivery wagon, model 2019a. The capacity of this wagon is 800 pounds. It has plain bearing motor and ball bearing countershaft and axles. The springs in the rear are half platform and the front springs are full elliptic. Steered by a side lever. The motor is suspended from the main frame by rocker arms. The front wheels are 36 inches in diameter and the rear wheels 42 inches. This equipment is especially designed for laundry delivery service. The body is very light and roomy.

SUPPLEMENTARY SPIRAL SPRINGS
GRAHAM PATENT
Teaming Without Breakage
Save your tires your engine, your patience and nerves. Booklet 15 free)
Supplementary Spiral Spring Co.
780 Broadway, New York (near 59th St.

Livery Service at Three Dollars an Hour

LIVERY touring cars are rather common throughout the country. Rich or sporty travelers who do not begrudge $15 or $20 for a few hours jaunt chiefly contribute to their maintenance. They are to be found in all large cities, and occasionally in small ones. The illustration shows Cleveland's asset in this branch of industry. The machines are not in any sense to be regarded as public conveniences. They are not nearly so smart in appearance as a motor cab, nor anything like so economical, either for those who hire or own them. Usually they are shabby antiques in the last stages of decay. A dozen of them would not bring $5,000. Their drivers are generally, illkempt and avaricious, but they possess wonderful gifts for keeping their old hardware in service. Two hours work a day is a good average for these vehicles. That will net $6. The drivers do not seek custom. To do so would be beneath their dignity. They are paid about $15 a week and found in tobacco by patrons. In winter they curl up. Nobody knows what becomes of them, nobody cares. They are the pirates of the road, taking toll from the unsuspecting, and serenely unaware that the regularly licensed and commissioned motor cab will soon deprive us of their company.

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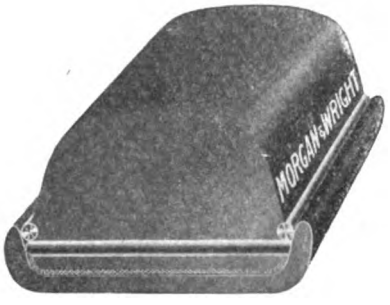
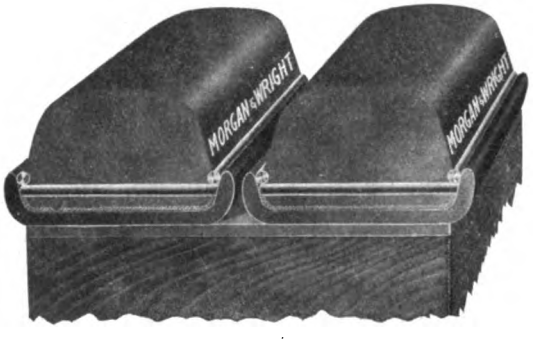
Morgan & Wright

SIDE-WIRE MOTOR TIRES

will reduce your motor tire expense.



Made in Either Single or Twin Style



They are made from stock especially compounded for commercial motor vehicle service, and for any type of vehicle from the light delivery wagon to the heaviest truck; or from victoria, coupe or brougham to the large sight-seeing car.

A test of these tires is equal to a "boost" for commercial motor vehicles. *Try them. Correspondence invited*

MORGAN & WRIGHT, Detroit, Michigan

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THE POWER WAGON

No. 37. CHICAGO, ILL., DECEMBER, 1907 Subscription, $2 per year. Single Copies, 20 Cents.

Studebaker

Modern Business Methods Demand Modern Equipment

It is the same in everything—the new way has come of doing old things—power delivery was bound to come and now it has proven that it has come to stay.

A power wagon can be driven as true as a die into a narrow door or passage and right out again. No confusion—no false starts and backing up—in short, no wasted time. It will do the work of three horse trucks and three drivers in less time and at considerably less expense.

The Studebakers have been building commercial power wagons since 1901 and this experience, coupled with their knowledge of the requirements of users of this class of vehicles gained in over fifty years spent in building vehicles for animal draft, has enabled them to produce various styles of commercial power wagons that meet practically every demand of the trade.

Send for our catalog. You will surely be repaid by a visit to our exhibit in the Seventh Regiment Armory at the Chicago Show.

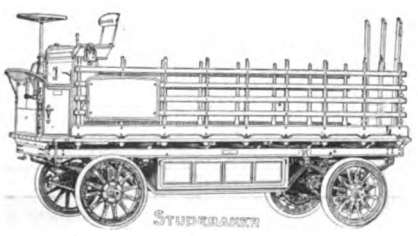
STUDEBAKER AUTOMOBILE CO.

South Bend, Ind.

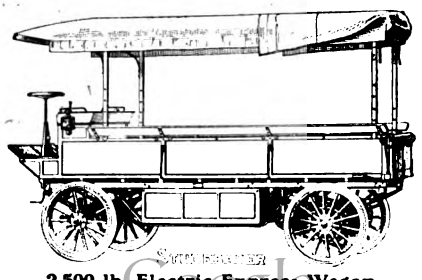
General Office, Cleveland, Ohio

Branches:

New York
Chicago
Kansas City
San Frandisco
Dallas
Portland
Denver



7,000 lb. Capacity Electric Stake Truck



2,500 lb. Electric Express Wagon

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Pressed Steel
Truck Frames

The
Parish & Bingham Co.
Cleveland, Ohio

DIAMOND
SPRINGS AND DROP FORGINGS
"Highest Standard of Refinement"

DETROIT STEEL PRODUCTS CO.
D
DETROIT, MICHIGAN.

Trucks and wagons with DIAMOND SPRINGS are successful—without them—DOUBTFUL

DETROIT STEEL PRODUCTS COMPANY
97 FORT ST., EAST, DETROIT, MICH.

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7 to 1 is the preference in solid tire equipment at the two New York Shows, voluntarily expressed in favor of

"Firestone"

Side-Wire Motor Tires :: The World's Standard

37 cars equipped with Firestone Solid Motor Tires.
5 Equipped with nearest competing type and make.

Seven other competitors divided the remaining twelve sets.
Every Firestone Tire was bought and paid for at regular prices.

FIRESTONE TIRE & RUBBER CO.

Branches and Agencies Everywhere AKRON, OHIO

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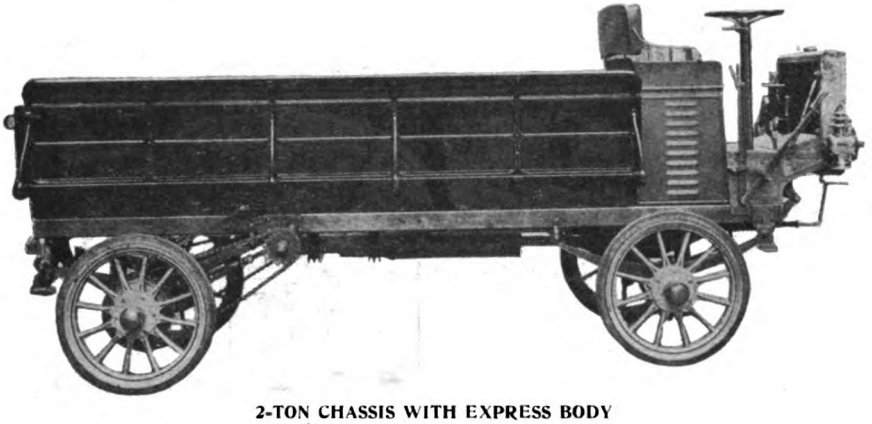
RELIANCE 1908 DETROIT



2-TON CHASSIS WITH EXPRESS BODY

DO YOU KNOW

We are To-day Building and Selling

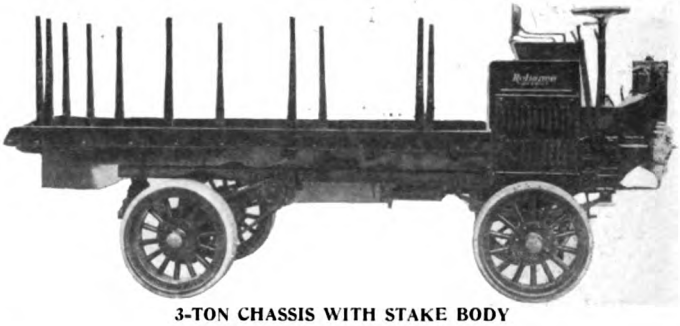
2-Cylinder, 2 to 2½ TON TRUCKS

3-Cylinder, 3 TON TRUCKS

4-Cylinder, 4 TON TRUCKS

EACH CAPABLE OF A 25 PER CENT OVERLOAD

THESE THREE SIZES



3-TON CHASSIS WITH STAKE BODY

Constitute the ONLY Capacities for Economical Trucking

Ask for Catalogue and Prices

RELIANCE MOTOR CAR CO.

Reliable Agents Wanted ::: **DETROIT, MICHIGAN**

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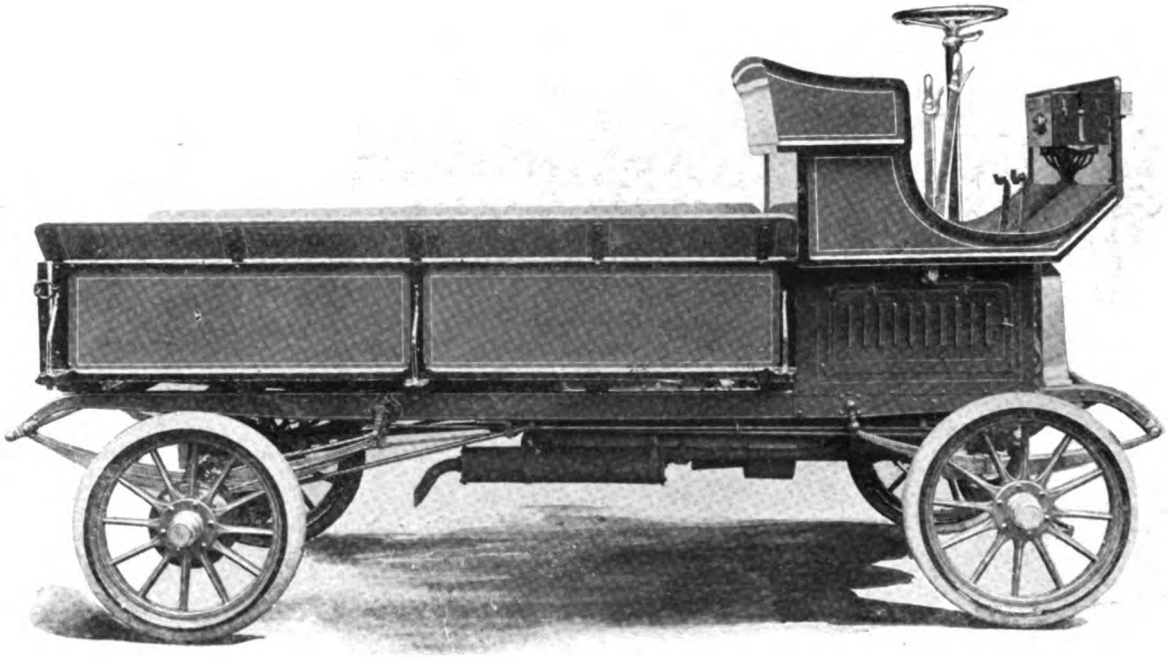
This is the Mitchell Motor Truck

Can Make Over 300 Miles on 26 Gallons of Gasolene

One Ton Capacity. 14 to 15 Miles Per Hour Speed



Now, then, Mr. Thrifty Man, figure this out for yourself —

The Mitchell Motor Truck can make 300 miles on 26 gallons of gasolene.

How much more would you have had to *pay out* to *maintain* a team of *horses* to cover the *same* ground?

If you dispense with your team, install a **Mitchell Motor Truck;** it will pay for itself in what it saves for you in a very short time. It will not only deliver for you greater quantities of goods in less time, but will be an advertisement for you, the value of which in newspaper space would amount to quite a pretty sum.

The Mitchell Truck is 20 H. P., 4 cylinder, one ton capacity, speed 14 to 15 miles. Price, $2,000.

Serviceable, efficient and reliable.

Write to us or any Mitchell Agent, ask for details about the Mitchell Truck and we'll furnish you with *proof* of its *efficiency* and *endurance.*

You can see the Mitchell Motor Truck in the *Commercial Vehicle* exhibit at the *Chicago Show,* Seventh Regiment Armory Bldg., Section F.

We shall be pleased to "show you" and *enlighten* you with *any* information on the Motor Truck proposition for your business.

Mitchell

Motor Car Co.

Member American Motor Car Mfg. Association

232 Mitchell Street, RACINE, WIS.

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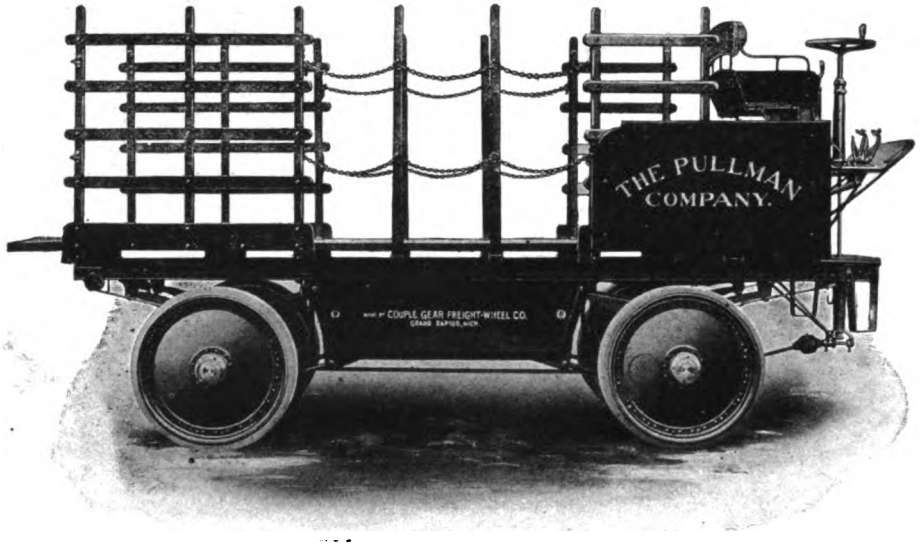
THE COUPLE-GEAR ELECTRIC TRUCK



Motors Contained in the Wheels.

Single Reduction of 25 to One.

The Wonderful Efficiency of this new mechanical means has been a Revelation to students of transmission.

The power is applied to both sides of the wheel at the rim and the wheel is turned in the same manner as you would a watch with the thumb and finger.
(The principle involved is known in mechanics as "Couple-Action," from whence we take our name.)

The entire energy of the Motor is converted into useful propelling force, giving the **Couple-Gear** Truck **Ample Mileage** for every condition of service.
(The mechanical transmission efficiency exceeds 97 per cent at normal load for the motors.)

Five Ton Trucks, driven and steered by **All Four Wheels,** operate equally as well in either direction.

One and **Two Ton Trucks, Front Wheel Drive and Steer,** rear wheels large diameter with steel tires or 36-inch dummy wheels with rubber tires.

SEE OUR EXHIBIT AT THE COMMERCIAL VEHICLE SHOW, CHICAGO, NOVEMBER 30th TO DECEMBER 7th.

RESPONSIBLE AGENTS WANTED!

COUPLE-GEAR FREIGHT-WHEEL COMPANY

GRAND RAPIDS, MICHIGAN

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The Power Wagon

A Journal for Those Employing Commercial Motor Vehicles

No. 37 | DECEMBER, 1907 | No. 37

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Chicago, Illinois.

Advertising Rates on Application

WALTER WARDROP, Editor

Application made for entry as Second-Class Mail Matter at the Postoffice in Chicago, Ill.

The Chicago Show

Description of Products Seen at the First Exclusive Industrial Motor Vehicle Exhibiton Ever Held in This Country

WHAT is it that justifies the massing of industrial motor vehicles in a Chicago exhibition hall at a time when the most heroic endeavors of banks and government are required to prevent the gravest business disorders?

Not their novelty surely.

Is it, then, their well established usefulness and economy? Undoubtedly.

* * *

The functions of a business auxiliary which is capable of being widely applied can always be counted upon to excite public curiosity, especially if it can be demonstrated that its adoption rests upon the secure foundation of economy. Such an instrument, whatever it may be, is introduced, adopted and retained solely because of the merit it possesses. Years ago the power wagon earned its right to a place in commerce. This it did when it was first demonstrated that it could haul merchandise, under circumstances suitable for its employment, more cheaply, more expeditiously, and with more constancy than it can be transported by horses. Where the conditions of service are unsuitable, the saving to be effected by the use of the power wagon is relatively small. Thus it is plain that the economy of the machine is a variable.

Short hauls and frequent stops are unfavorable conditions for the power wagon. Although in such service the use of the machine is not distinctly indicated, there is no sound reason for supposing it to be prohibited. Under such circumstances one of the most useful functions of the machine, its speed, is suppressed, and naturally its economy is dwarfed by comparison with what it develops in service where routes are long and stops infrequent. Distance and activity of service, the two elements which impair the value and increase the cost of horse transportation, are the chief sources of profit in operating power wagons. Given these, one unit hauling by mechanical power does the work of two, three, four and sometimes five units hauled by horses.

* * *

The fondness of humanity for perceiving and calling attention to misfortunes, grave or trivial, is well known. Thus everybody has heard of motor wagons which give trouble. When the public electric light supply or the street car service is temporarily interrupted there is general amazement in every quarter except the operating plant, where such phenomena are taken as a matter of course. Illiberal opinion is the common vice. It would be instructive to compare the effective work of a thousand draft animals with that of a like number of motor wagons, to contrast the involuntary idle hours of each, the diseases from which both suffer, the mortality, and all the other items which can be advantageously set off one against the other. Machinery becomes deranged, even when it is automatic in action and bolted to a factory floor. It is expected to show normal signs of wear. But who ever heard of a thousand motor wagons being put out of commission in a single day in one city, because of a rise in temperature? That is the condition of horse transportation in the sultry days of summer here in Chicago, or any other city of its size. Glanders destroys thousands of animals every year and not infrequently cripples a transportation service. For these and like reasons the percentage of spares to service animals is always high, frequently as much as 25 per cent of the equipment being kept in idleness as emergency reserves. What waste! What inefficiency!

The reliability of the power wagon, when well handled and intelligently cared for, supplies the last argument for its universal adoption. The thousands of ma-

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chines now in use are retained because of their serviceability.

One would have to search closely in the animals of civilization before coming across anything which since Adam's time has exhibited so little improvement as draft animal transportation. In extenuation of this slow progress we are told that the primary horse was no bigger than a goat, and that it has taken thousands of years of breeding to bring him to his present picturesque proportions. This is bad pleading. What most concerns the users of draft animals is to know if the descendant of the eohippus is equal to the work modern commercial life has assigned to him. Is his usefulness rivaled by invention? Is it eclipsed by it?

In roughly casting up the draft animal's account we find that he is an economic nuisance. He creates fully as much work as he accomplishes; he communicates disease with his filth; his development appears to be arrested; he has reached the limit of his usefulness; he is too numerous for human comfort and too slow and infirm for modern commercial necessities. Until the advent of the automobile his usefulness to man was never questioned. Now that the utility and convenience of each can be contrasted a balance is always struck in favor of the machine.

Whatever lingering sentiment exists for the retention of the draft horse must be imputed to those who breed him for gain. As a factor in commercial life his room is more desired than his company, for his labor is less useful and less economical than that of machines. The most powerful draft horse has a very limited capacity. On the other hand, the work capacity of a machine is practically unlimited, or else governed by its activity.

The Chicago industrial motor vehicle show informs us of the force, character and variety of the new movement in minor transportation, shows us of what elements it is composed, and how confident of success are those who participate in it. Back of the display, and supplying strong confirmatory proof of all that is claimed for the utility, convenience and economy of the automobile in business, are over 11,000 machines whose total value is not far from $17,000,000 and whose daily service testifies more plainly than any other single fact the position they have won in commerce. There are thousands of establishments which, since the introduction of the power wagon, have partially abandoned draft animal service in city and rural transportation. Some place their whole dependence in the machine. A fair idea of the confidence which experienced motor wagon users repose in the reliability and economy of their machines may be gathered from the fact that the Adams Express Company has within three years purchased 300 of them. Why has this company invested so heavily? Anyone can answer.

The exhibits at the Chicago show are of the most catholic character. They are as follows:

American Motor Truck Co., Lockport, N. Y.

This firm is building gasoline trucks of 3 and 5-ton capacity. These machines are equipped with a 40 hp. slow speed four attached to throttle in the carburetor, attached to throttle in the carburator, which is of automatic feed type. Ignition is by jump spark, current being obtained from storage battery and dry cells. Force feed lubrication takes care of the cylinders, the crank case lubrication being splash. There are no soldered joints in the radiator, which is of the built-up type. Planetary transmission gives two forward speeds and a reverse.

The drive is through metal disc clutch to jack shaft equipped with spur gear differential, and thence by side chains to rear wheels. The channel steel frame is hot-riveted. Semi-elliptic springs are used in front. The rear springs are of platform type. The front axle is of I-beam section. The rear axle is square, fitted with roller bearings. Wheels are 36 inches in diameter, the rear ones being shod with dual tires. Two brakes are placed on the jack shaft, and two more for emergency work are fitted to the rear wheels. A supplementary drag bar brake is also supplied.

The fuel tank holds 18 gallons of gasoline. The maximum speed of the 5-ton truck is 8½ miles an hour, that of the 3-ton truck 12 miles an hour.

* * *

Mitchell Motor Car Co., Racine, Wis.

The one-ton gasoline truck made by this company has a 50 per cent overload capacity and it fitted with a spiral or worm gear drive. This gear is more costly than the bevel gear, but its makers claim advantages for it is not possessed by the other, such, for example, as silence and smoothness in operation, the impossibility of breakage, and its efficiency when climbing hills under load.

The truck, equipped with motor developing 20 hp. at 950 revolutions per minute, is constructed throughout of special material, and with the exception of the engine and lubricator is virtually a new model designed expressly for commercial service. The gear ratio is six to one on the high, which enables the machine to make a speed of 15 miles an hour. The wheel base is 110 inches. The tread is 56 inches. The front wheels are equipped with 30x3 inch tires, and the rear wheels with 30x3½ inch. The transmission is of the sliding gear variety, with three speeds forward and a reverse. The front axle is of I-beam construction. The weight of the truck, without load, is 2,200 pounds. Ignition is accomplished by means of a magneto located at the left side of the engine. A stiff frame work surrounds the engine and supports the driver's seat and foot boards, giving the maximum space for the carrying platform. The side boards of the engine compartment are easily removable, making both sides of the engine accessible.

* * *

A. D. Meikelbach Motor Wagon Co., North Milwaukee, Wis.

This firm is exhibiting a one-ton gasoline wagon, a two-ton brewery bottle wagon with sliding doors, and a sight-seeing car with capacity for 14 passengers. These machines are double side chain driven. The distinctive features of all Meiselbach machines is the perfectly supported double mitre friction drive.

The crank shaft is continued well back to the rear axle, this continuation carrying three conical friction wheels made of tarred fiber, which are brought into contact with a pair of large-diameter mitre disks carried on cross shafts, from the ends of which shafts the two side chains connect the back wheels. Three friction wheels are needed on the continuation drive shaft, the forward one for the reverse speed, the back two for driving ahead, the larger one of the two for starting on slow speed, and the smaller one for driving direct. The disks are of a combined disk and cone design, with a 4½-inch face on the friction cone wheels, and as these cone wheels are thrust by means of ball trusses against the cones on the large disks the contact is made without a direct side thrust on the disks.

The low forward and reverse cones work on a sliding key on the drive shaft; the high speed cone wheel is held to the drive shafts by set screws, and when it is brought into use the entire shaft is moved forward, which is made possible by a sliding joint in the forward part of the shaft. The large mitre disks are of gray iron, made with as smooth a friction surface as possible, and each is carried on a short shaft of two-inch material, which shaft is in turn carried in phosphor bronze bearings.

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On the right side, the chain sprocket is carried on the end of the shaft carrying the disk, but on the left side the chain sprocket is on a short shaft paralleling the disk shaft and just ahead of it. This short shaft is driven from the disk shaft through bronze and steel gears always in mesh. The short shaft is essential to get the proper drive at the back wheels, the left disk revolving in a direction opposite to the right one at all times. The entire transmission parts are carried in a case attached to the underside of the main frame.

The one-ton wagon is fitted with a two-cylinder, 15-18 hp. engine. Its chassis weighs 2,700 pounds. The three-ton wagon weighs 3,700 pounds and is fitted with a 25-28 hp. engine of the same type. The speed of the light wagon is limited to 12 miles an hour, that of the heavy wagon being limited to 10 miles an hour. Both models are fitted with roller bearing axles, I-beam in front and square in the rear. The track of both is 60 inches. In the The track of both is 60 inches.

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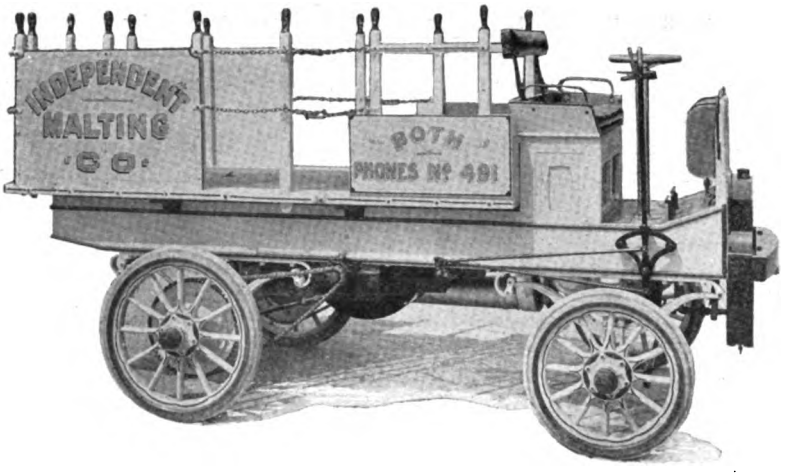
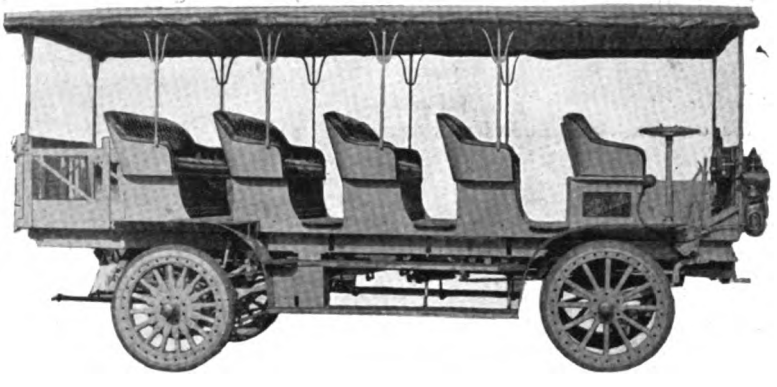
Reliance Motor Car Co., Detroit.

Three models made by this company are on exhibition. They are its two, three and four-ton trucks. All have capacity for 25 per cent overload. For three years this company built only one chassis, rated at two tons, but having maximum capacity of three tons. During the past year, however, the company has been developing and testing its two heavier models which are equipped with engines having more horse power than the two-ton machine, and the parts dimensions for which have been increased to care for heavier loads.

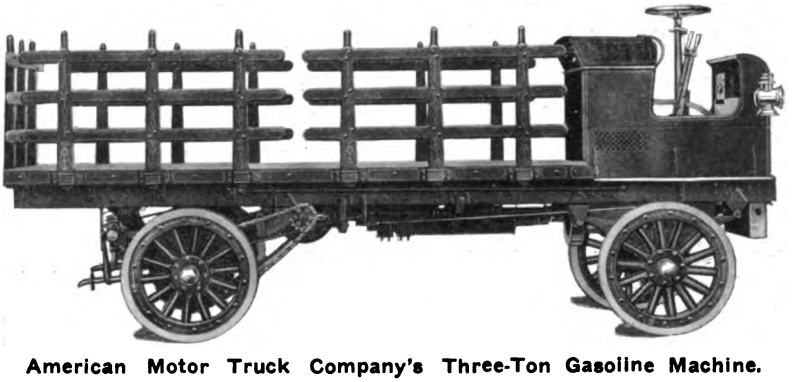
The engine of the two-ton truck is of the two cylinder two cycle variety. The three-ton truck is equipped with an engine of the three cylinder two cycle variety. The four-ton truck has a four cylinder two cycle engine. The engine rating of the two-ton truck is 30 h.p., of the three-ton truck 45 h.p., and of the four-ton truck 60 h.p. In all three models the bore of the engine is 5⅛ inches and the stroke 5 inches. The igni-



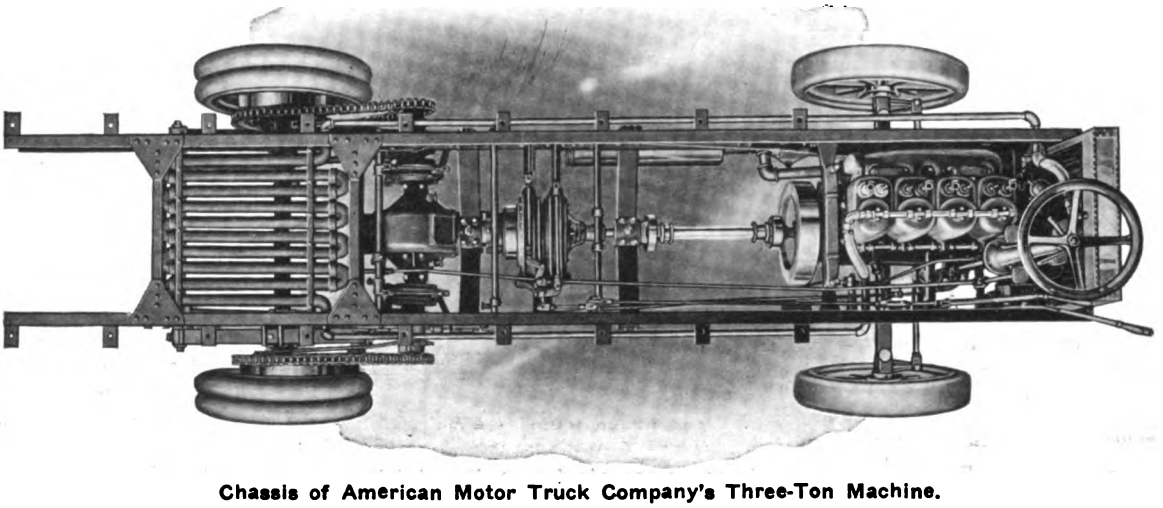
Meiselbach One-Ton Gasoline Truck.



Oscar Lear Eighteen-Passenger Gasoline Bus.



American Motor Truck Company's Three-Ton Gasoline Machine.



Chassis of American Motor Truck Company's Three-Ton Machine.

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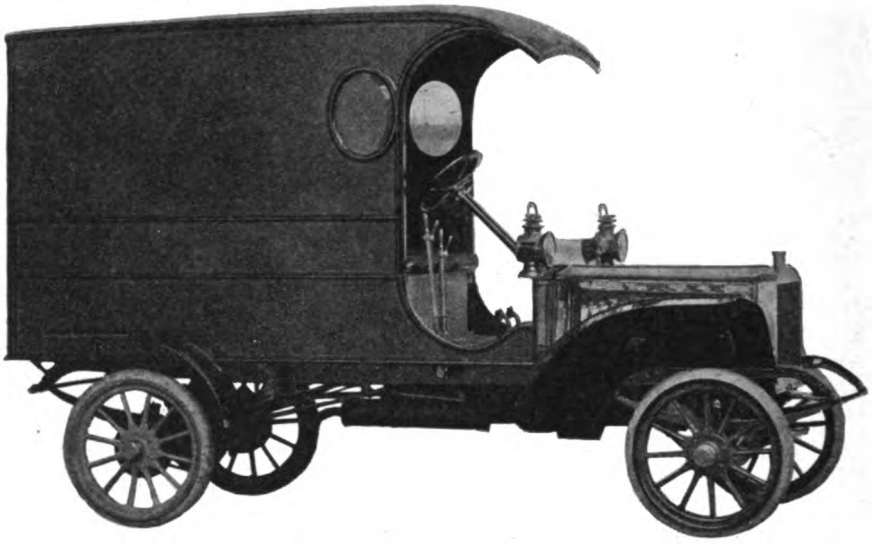
tion in all models is produced by jump spark. The transmission is of the sliding gear type, with three forward speeds. The drive of all models is from jack shaft by double side chains to rear wheels. Front axles are heavy I-beam drop forgings with drop forged steering knuckles and roller bearings. The rear axle of the two and three-ton trucks are of solid three inch round forged steel. The rear axle of the four-ton truck is 3½ inches in diameter forged steel. The frame of the two and three-ton trucks is cold pressed steel. The frame of the four-ton truck is heavy channel steel. Wheels of the two-ton truck are 32 inches in diameter, while those of the three and four ton trucks are 36 inches. The two-ton model is fitted with 4 inch tires throughout. The 3-ton model has 5-inch tires in front and 3½-inch twins in the rear, while the 4-ton truck is fitted with 5 or 6-inch tires in front and 3½ or 4-inch twins in the rear.

The chassis of the 2-ton truck has a frame 36 inches wide by 10½ feet long, back of the driver's seat. Bodies may be built any width up to 6 feet, and in length 10½ feet to 13 feet. The chassis of the 3-ton truck has a frame 36 inches wide by 10½ feet long, back of the driver's seat. It will accommodate any body width up to 6 feet and any body length from 10½ to 13 feet. The chassis of the 4-ton truck has a frame 36 inches wide by 15 feet long, back of the driver's seat. It will accommodate any width body up to 5 feet slope and a 4 feet level and of any length from 15 to 17 feet. Tread of the 2-ton truck is 56½ inches, that of the 3-ton truck 58 inches, and that of the 4-ton truck 77 inches. The wheel base of the 2 and 3-ton models is 108 inches, and that of the 4-ton model 136 inches.

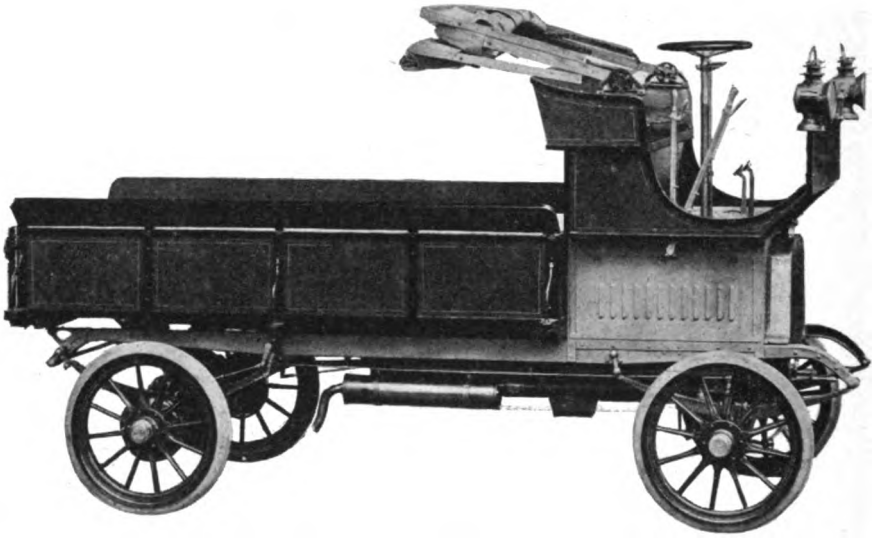
* * *

Oscar Sear Automobile Co., Springfield, O.

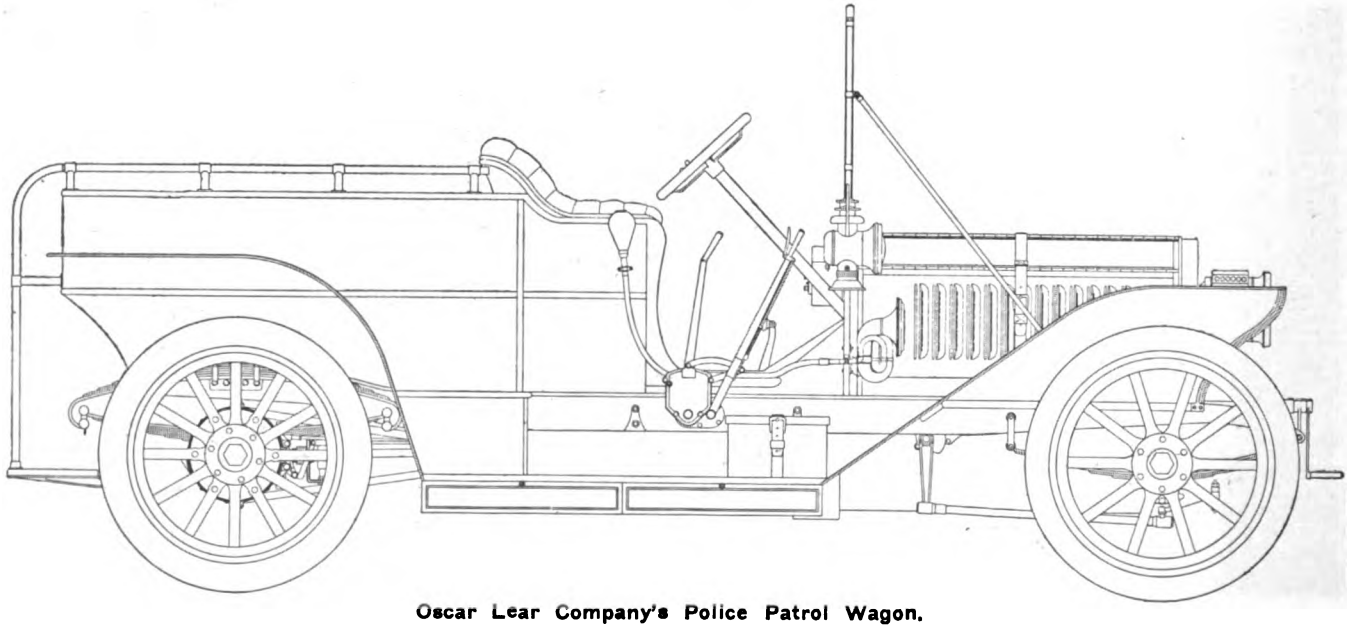
This firm is exhibiting two of its 24 hp. air-cooled gasoline wagons equipped with different kinds of batteries, a fire department combination motor hose and chemical wagon erected by the Seagreve Company at Columbus and containing the Frayer-Miller engine, and a 50 hp. air-cooled truck chassis with capacity for three tons and interchangeable for motor bus work. The drive of all machines is by side chains from jackshafts to rear wheels. The company's



Mitchell One-Ton Gasoline Delivery Wagon.



Mitchell One-Ton Gasoline Truck.



Oscar Lear Company's Police Patrol Wagon.

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police patrol wagon is fitted with a 50 hp. air-cooled engine, having four cylinders with 5½-inch bore and 5⅛-inch stroke. The wheel base is 122 inches. Wheels are 36 inches in diameter, fitted with 4½-inch tires. The total weight of the vehicle is 2,850 pounds. Its maximum speed is 60 miles an hour.

* * *

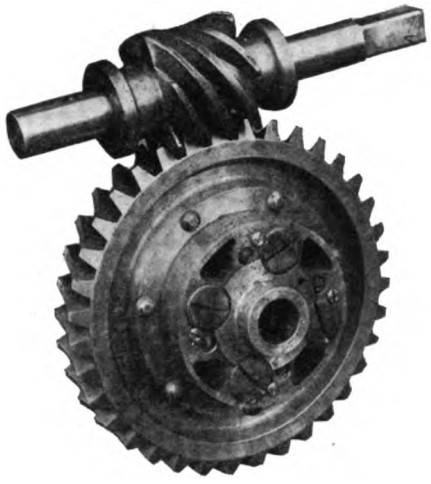
Studebaker Automobile Co., South Bend, Ind.

Any type of electric business vehicle from 800 to 10,000 pounds capacity can be procured from this company. It is exhibiting an 800-pound delivery wagon, a 1,000-pound wagon chassis, a 2-ton stake truck, a 3½-ton stake truck, a 5-ton stake truck, a 2,500-pound express wagon with top, and a 14-passenger omnibus.

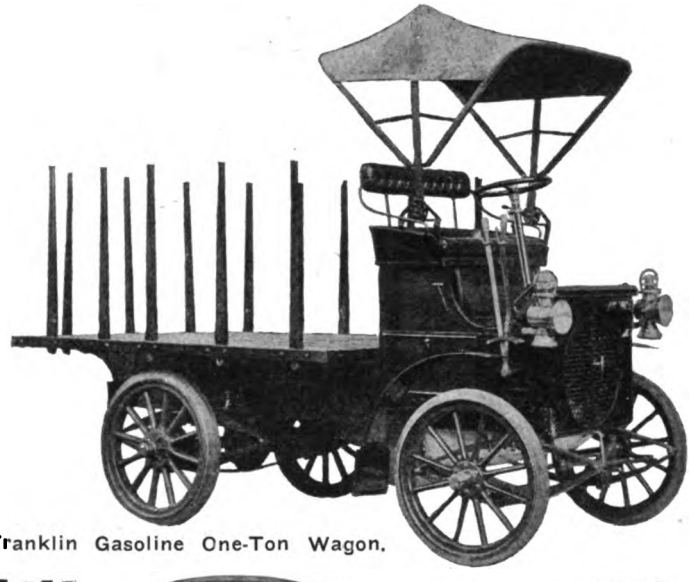
The five-ton truck is fitted with two motors, 80 volts 35 amperes rating. Battery contains 44 cells, 19 m.v., eleven in each tray. The vehicle will travel 27 miles on one charge over level and hard surfaces with average load, assuming that average load is two-thirds of rated weight capacity. Under the above conditions the maximum speed is 6¼ miles per hour. The gauge, measured between centers of tires, is 73¼ inches. The wheel base is 10 feet 6 inches. Front tire dimensions are 36 by 7 inches; rear tire dimensions 36 by 4 twins. The extreme length of the vehicle is 17 feet; its extreme width is 92½ inches. Dimensions of clear carrying space, length and width only, are 14½ by 5½ feet. The dead weight of the truck is 9,800 pounds. The weight of battery and trays is 2,850 pounds. The ampere-draw is 68—fourth notch—on level streets, with average load of two-thirds rated weight capacity. The battery is suspended under the frame. The motor is suspended from the frame chain drive. The truck is wheel steered. The number of kilowatt hours required for each full charge of battery is 31.4 net, or 39.4 from 125 volts. Minimum voltage essential for charging, 115. Minimum of amperes which should be available on charging circuit for charging battery, 75.

The 3½-ton truck has the same motor equipment as the 5-ton machine. Its battery has 44 cells, 17 m.v. Its travel radius, however, under the condition already described, is 30 miles at a speed of 7½ miles per hour. Its wheel base is 10 feet 7 inches. Front wheels are fitted with 36x5-inch single tires; rear wheels are fitted with 36x4 twins. The gauge is 72¼ inches. The clear carrying dimensions, length and width only, are 12 feet 4 inches by 5½ feet. The total weight of the vehicle is 8,550 pounds. Weight of battery is 2,490 pounds. The ampere-draw, on fourth notch, over level streets with average load is 65. Extreme length is 18 feet 7 inches. Extreme width is 92 inches. Battery is underslung. Motor is suspended from frame chain drive. Number of kilowatt hours required for each full charge of battery, 29.6 net or 35 from 125 volts. Minimum voltage for charging, 115. Minimum amperes which should be available on charging circuit for charging battery, 65.

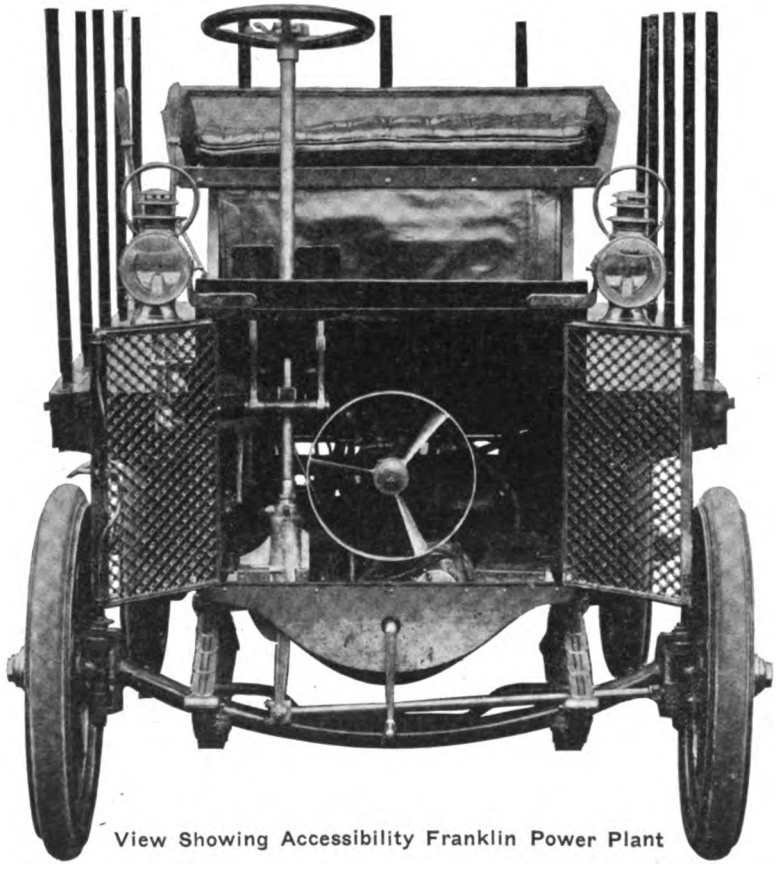
The 2-ton truck is fitted with two motors, each rated at 80 volts 30 amperes. Battery consists of 44 cells, 15 m.v. This truck has a range of 30 miles with average load, and maximum speed of nine miles an hour so loaded. The gauge is 61 inches; wheel base, 9 feet 9 inches; front tires, 36x5; rear tires, 36x3½ twins; clear carrying dimensions, length and width, 11½ feet by 5 feet; total weight, 6,800 pounds; ampere-draw, on level streets with average load, 42½ on fourth notch; extreme length, 15½ feet; extreme width, 78 inches; weight of battery, 2,230 pounds; kilowatt hours required for full charge, 24.8 net or 30.7 from 125 volts; minimum voltage



Spiral Gear Drive Fitted to Mitchell Truck.



Franklin Gasoline One-Ton Wagon.



View Showing Accessibility Franklin Power Plant

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for charging, 115; minimum amperes that should be available on charging circuit, 60.

The 2,500-pound express wagon is fitted with motors rated at 80 volts and 20 amperes; has 40-cell battery, 13 m. v.; traveling radius, 35 miles with average load; speed, 9¼ miles an hour; gauge, 58½ inches; wheel base, 111 inches; front and rear tire dimensions, 36x4 inches; total weight of vehicles, 5,600 pounds; ampere-draw, with average load on level streets, 41 on fourth notch; weight of battery, 1,760 pounds; extreme length, 13 feet 11 inches; extreme width, 74 inches; kilowatt hours required for full charge, 20 net or 22 from 110 volts; minimum voltage for charging, 104; minimum amperes which should be available on charging circuit, 50.

The 1,000-pound delivery wagon is fitted with two motors each rated at 80 volts 14 amperes. It has battery of 40 cells, 9 m. v., a range of 35 miles and a speed of 12 miles an hour with average load. Unlike the models already described, it is steered by side lever, the heavy duty vehicles being wheel steered. Gauge is 56 inches; wheel base, 92 inches; tire sizes, 36x3 inches; total weight, 3,500 pounds; ampere-draw, 32 on fourth notch, with average load; weight of battery, 1,215 pounds; extreme length, 11 feet 2 inches; extreme width, 70 inches; kilowatt hours required for full charge, 13.5 net or 15 from 110 volts; minimum voltage required for charging, 104; minimum amperes for charging battery, 35.

The 800-pound panel side delivery wagon is fitted with single motor rated at 40 volts 24 amperes. It has 24 cells of 11 p. v. battery; range, 30 miles; speed, 12 miles per hour; side lever steering; gauge, 54 inches; front tire dimensions, 36x2½; rear tires, 42x2½; total weight, 2,700 pounds; ampere-draw, with average load on level street, 34; battery weight, 794 pounds; extreme length, 10 feet 8½ inches; extreme width, 70 inches; number of kilowatt hours required for full charge, 8.25 net or 9.35 from 62.5 volts; minimum voltage for charging, 62.5; minimum amperes for charging, 35.

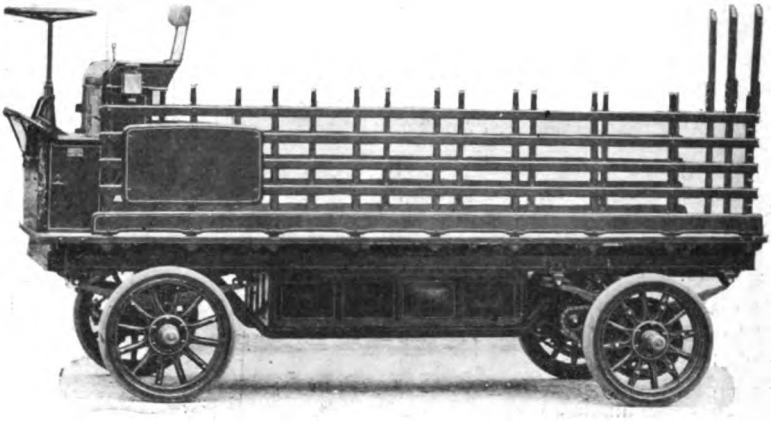
The 14-passenger omnibus is fitted with two motors, each rated at 80 volts 30 amperes. The battery contains 40 cells 13 m. v. The radius of this vehicle on a single charge is 35 miles at a speed of 9¼ miles an hour. The machine is wheel steered. Its extreme length is 14 feet 9 inches. It is 73 inches wide. Wheel base is 111 inches; tires, 36 x 4; gauge, 58 inches.

* * *

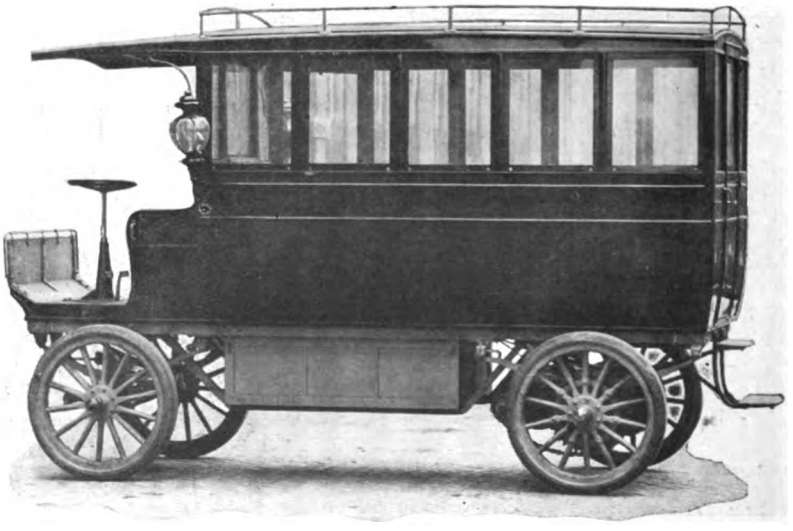
Rapid Motor Vehicle Co., Pontiac, Mich.

This firm is making the largest exhibit of industrial motor vehicles ever seen at any automobile show in this country. Its 1908 chassis is extremely simple and very strong. By employing a double opposed type of motor of its own design the company has succeeded in producing a vehicle with a large pulling capacity and capable

Studebaker Five-Ton Electric Truck.



Studebaker Two-Ton Electric Truck.



Studebaker Fourteen-Passenger Electric Bus.

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of withstanding considerable overload upon occasion. Perfect valve design and construction are two important factors in bringing about this result. By actual card test both the fire chambers are almost exactly at atmospheric pressure during intake and just after expansion stroke. This relieves the engine completely of forcing the intake or exhaust, permitting all of its power to be directed against the driving mechanism. All valves are interchangeable and can be removed, together with the cage, by simply unscrewing a nut after removing the crank case cover. On the one-ton wagon the cylinders measure 5x5, and on the 1½-ton 5¼-inch diameter by 5-inch stroke, developing 24 and 30 h.p. respectively. By loosening a few cap screws on the crank case cover, it can be removed, permitting access to the working parts with no inconvenience whatever. The accessibility of a wagon largely determines the voluntary care it will receive.

The piston action creates a partial vacuum in the crank case, and by means of a check valve this suction is made to prevent the surplus oil leaking out of case or getting into fire space. The transmission is of the planetary type, and as an extra preventive of harm to the gears through excessive strain they are made with an 8-10 pitch and 1¼-inch face. The reverse and law speed drums, which cover the gears, are so constructed that they will hold a quart of oil without leaking, thereby permitting perfect lubrication of all transmission parts without splashing the rest of the car with oil. Another excellent feature of the 1908 Rapid is the convenient location of the fuel and water tanks. They are placed side by side in the dash, each being replenished through an opening in the top. Besides saving much valuable space by this arrangement, the serious danger of gasoline getting on a hot exhaust pipe in case of an accident is eliminated.

Pistons and all friction bearings are constanlty lubricated by a positive driven oiler, the amount necessary for each determining the supply. A double side roller chain drive is used, the differential being in the jack shaft. The smooth running resulting from the sprockets being made in pairs and on a gear shaper fully justifies the extra work. The tires are solid endless rubber, 3½ inches in width. The two speeds forward and reverse are controlled by two foot pedals and one high speed lever, which also supplies the internal hub brakes with one movement.

The company makes two types of chassis, one for one-ton loads and one for loads of 3,000 pounds. The former is fitted with a 24 h.p. engine, and the latter with a 30 h.p. engine.

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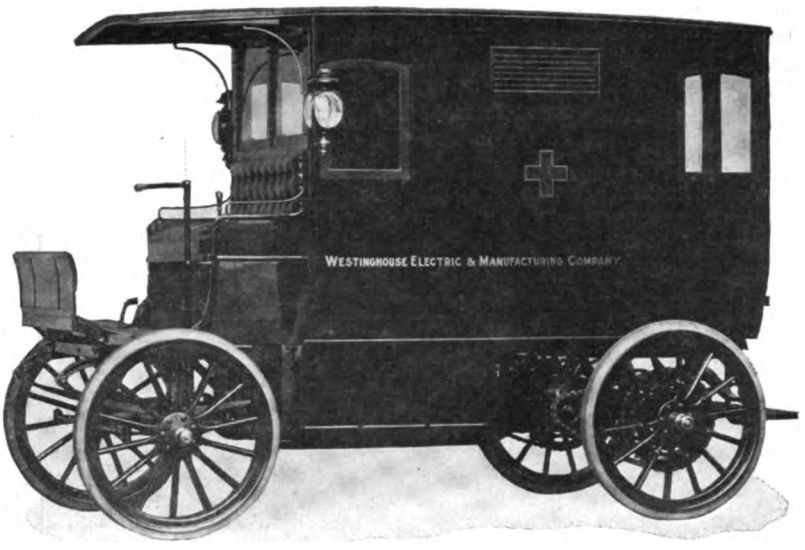
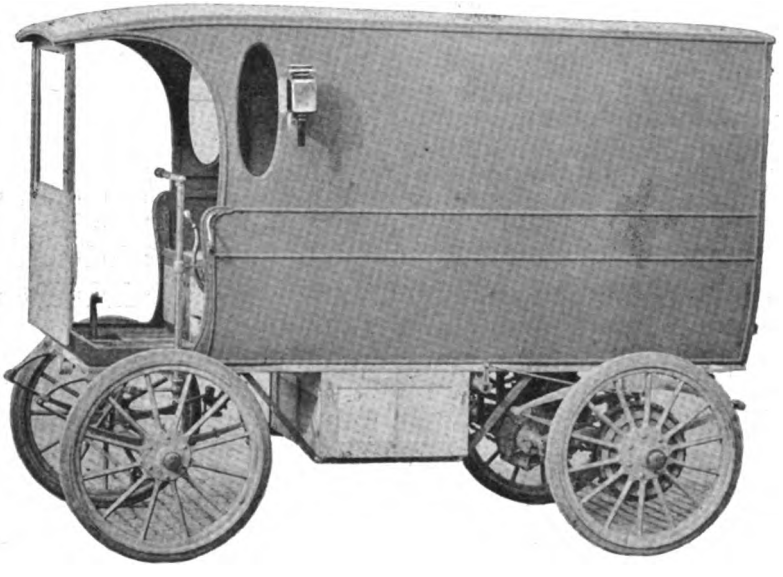
Logan Construction Co., Chillicothe, Ohio.

This firm exhibits three models, a light delivery wagon rated to carry 1,500 pounds, a one ton wagon with engine rating of 20



Studebaker Electric Ambulance.



Studebaker 800-Pound Electric Delivery Wagon.

Studebaker 2500-Pound Electric Wagon.

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h.p., and a 3-ton truck with engine rating of 40 h.p. The one ton model is a miniature of the 3-ton machine. A description of the 3-ton model, therefore, will answer for both.

All points of friction are carried either on ball or roller bearings. All gears are of chrome nickel steel. The propeller shaft is of the same material. The front axle is manganese bronze, the rear a solid steel forging. The frame is 5-inch rolled channel steel. The engine, which is water cooled, is of the four cylinder variety. It is mounted on a 5-inch pressed steel subframe. The oiler has been cast with the engine crankcase, circulation being assured by a gear pump. Tests have shown a high efficiency combined with great economy in the matter of lubrication of these trucks. The clutch is of the multiple disc type. A propeller shaft with two universal joints transmits the power to the gear set by which three forward speeds and reverse are obtained on the selective principle. From the countersaft to the rear wheels the drive is taken by side chains of 1½-inch pitch and ¾-inch width. The heavy side chains are guaranteed to stand a strain of 60,000 pounds each, and the makers claim that one set will give good service for at least two years. All gear changes are obtained by a single lever at the right of driver's seat. The emergency brake lever is equally accessible. Clutch and running brakes are operated by foot pedals. To simplify gear changes the clutch and propeller shaft are automatically braked on the operation of the foot clutch or the emergency lever. Security is assured by five brakes, one set on the rear hubs, one set on the jack shaft and one brake on the clutch. Steering is of the worm and nut type. Front and rear axles have ample strength above the heaviest load capacity of the vehicle. The rear axle is of solid steel, 2½ inches square, with integral spring seats. Roller bearings are used for the road wheels and for the steering knuckles. Tire dimensions are 36 inches by 5 inches in front and 3½-inch twins in the rear.

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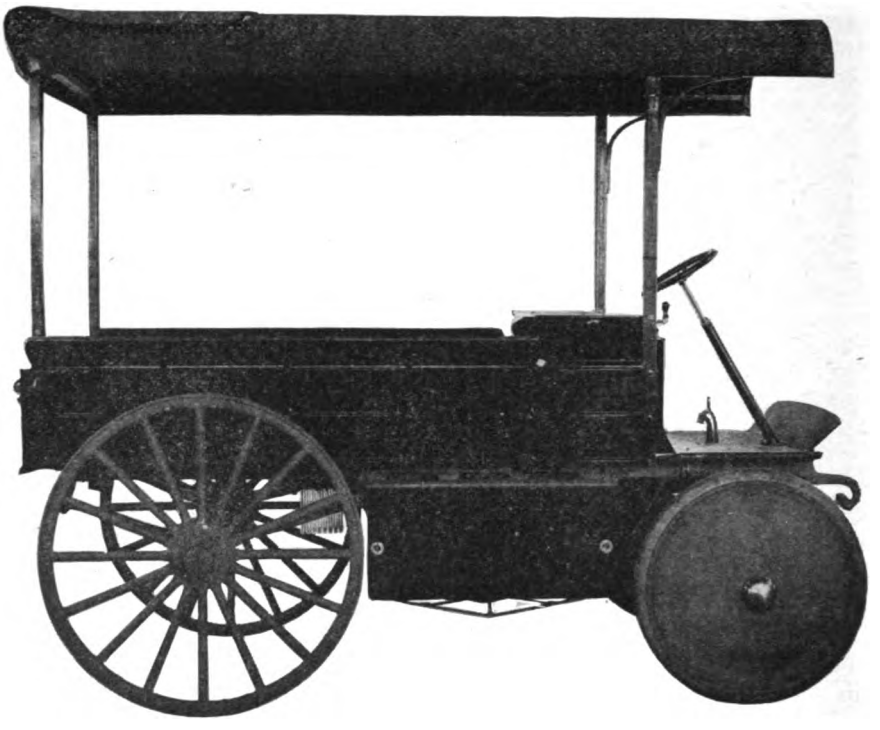
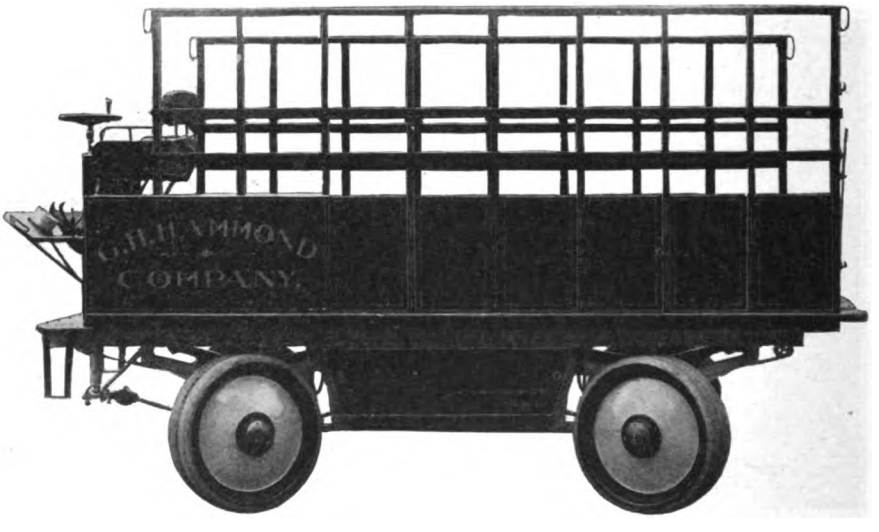
Couple Gear Freight Wheel Co., Grand Rapids.

This firm makes 1, 2 and 5-ton electric trucks. The 5-ton machine is driven and steered from all four wheels. The motors are contained in the wheels and deliver their force from two opposite points at the wheel rim. The gear reduction is 25 to 1, which is accomplished without the aid of countershafts. This new mechanical means applies the power equally to both sides of the wheel and eliminates practically all transmission losses. Speed, 6 miles per hour with load.

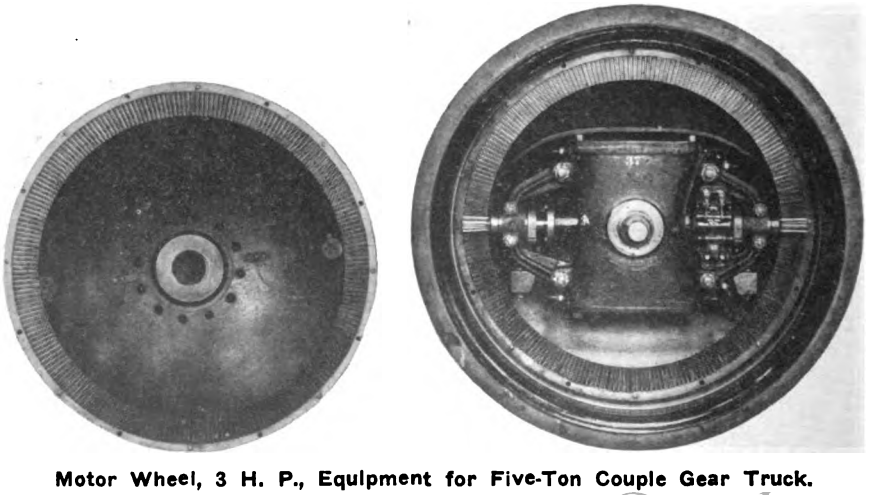
In steering from the four wheels the rear wheels swing in the opposite direction from the front wheels, the degree of deflection being the same, and the four wheels actuate simultaneously from the single hand-wheel. Compared with two



Couple Gear One-Ton Electric Truck. Front Wheel Drive and Steer. Rear Wheels Steel Tired.



Couple Gear Five-Ton Electric Truck, all Four Wheels Drive and Steer.



Motor Wheel, 3 H. P., Equipment for Five-Ton Couple Gear Truck.

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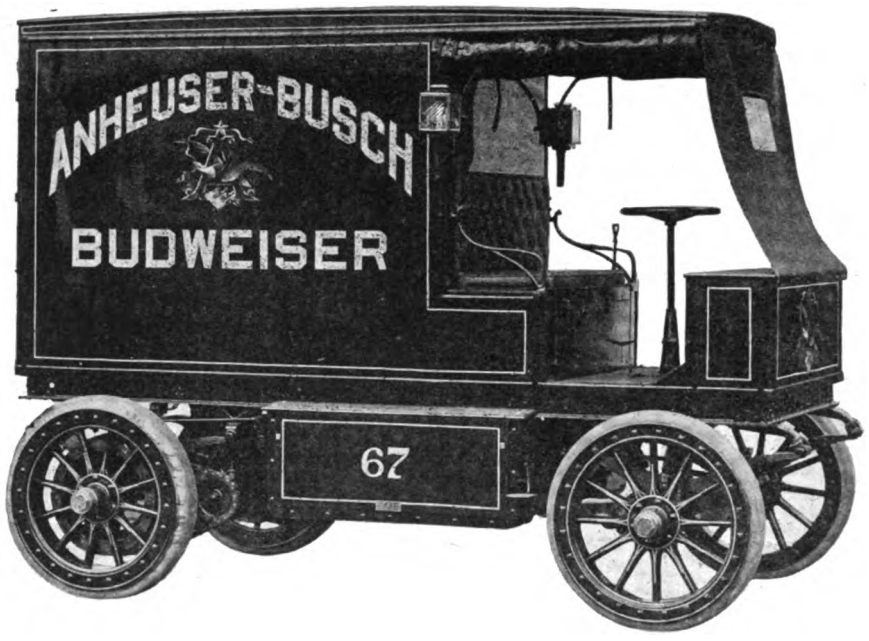
wheel steer, the deflection of the wheels is but one-half for the same turn. The truck will turn in an extremely short space, and can be driven backward equally as well as forward. This convenience is especially appreciated in congested traffic and in getting through soft places where the rear wheels follow exactly in the tracks of the forward wheels. Each of the four wheels is fitted with a fiber brake band. Two foot-pedals are used, one for the front wheels and one for the rear wheels, giving two independent brake outfits.

The controller is of the cylinder or trolley-car type, giving five speeds forward and five speeds reverse. The manipulation of four driving motors gives great flexibility of control and prevents any sudden strain, even in starting from rest on the steepest hills with load.

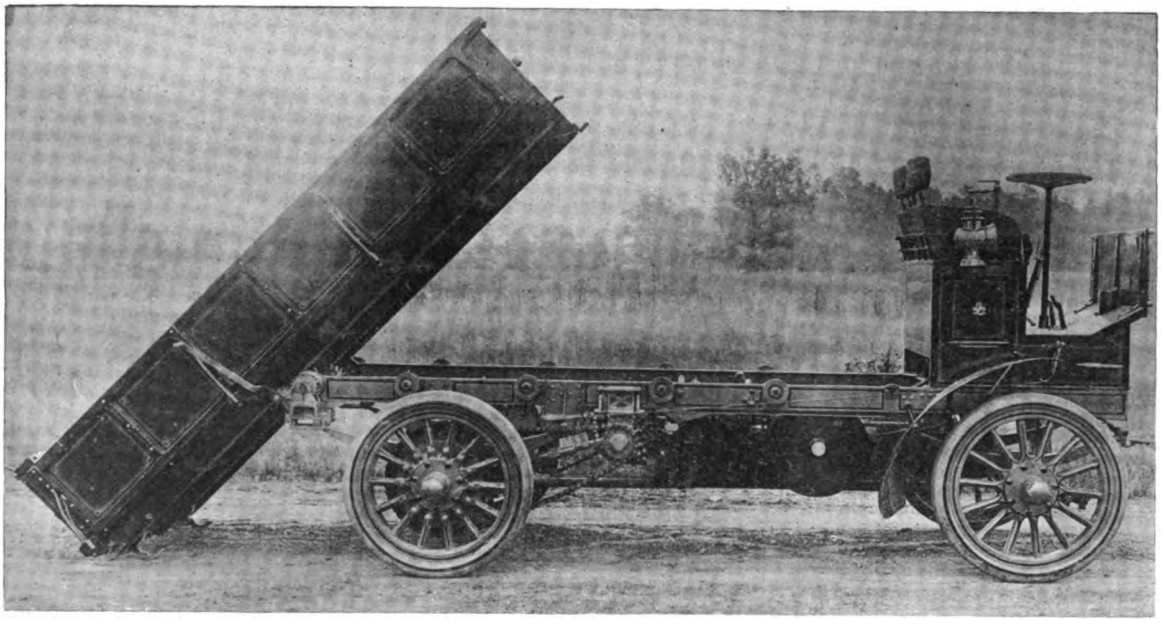
Motors are of special design manufactured in the company's own plant. They are series wound and develop a speed of 1,400 revolutions per minute while driving the truck at six miles per hour. Each is rated at 3 hp., railway motor rating, being 12 hp. for the four wheels, and will stand an overload of more than 200 per cent for an emergency pull. Less than six electrical horse-power is required to drive the machine on level road at six miles per hour with full load. If occasion requires, 40 electrical horse-power is available momentarily without injury to the motors.

Wheels are saucer shaped, ¼-inch boiler steel, which is the functional equivalent of spokes. The motor and motor frame are contained in the dust-proof casing formed by the cupped wheel sides and the wheel rim. Plain roller bearings are used. Tire equipment is 4-inch dual both front and rear. Axle frame is the same front and rear, and is of wrought steel, double construction, braced with cast steel trusses. This affords a wide support for the cast



Pope-Waverley Electric Brewery Wagon.

Knox One and One-Half Ton Gasoline Express Wagon.



Knox Gasoline Tipping Sand Wagon, Body Sliding in Steel Grooves.

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steel steering knuckles which carry the motor wheels. Flexible cables connect the motors, through the center of the wheel axle, to a plug and receptacle which make the proper connection with the battery and controller.

Body frame is of I beam construction, with reinforced oak cross joists. The battery frame is supported below the body, connecting with one end of the four springs and having a brace from each corner below reaching to the lower section of the double axle frame. This gives a very rigid truss for resisting the torque of the four motor wheels.

The 1-ton and 2-ton models are driven and steered from the front wheels only. The rear wheels of the 1-ton model are similar to those of an ordinary horse-drawn express wagon, being of large diameter and equipped with steel tires. The front wheels are similar to the motor wheels of the 5-ton truck, and are equipped with 3½-inch tires. When specified 36-inch dummy wheels are supplied for rear, having same appearance as the motor wheels in front and equipped with the same size rubber tires. The motor-wheels on the 2-ton model are equipped with 5-inch tires and the rear dummy wheels are equipped with either rubber or steel at option of purchaser. The same style of controller is used for the lighter models, which also have the five speeds forward and five speeds reverse. Speed of 1-ton truck is 9 miles per hour with load, and 11 miles per hour empty. Speed of 2-ton truck is 7½ miles per hour with load, and 9 miles per hour empty.

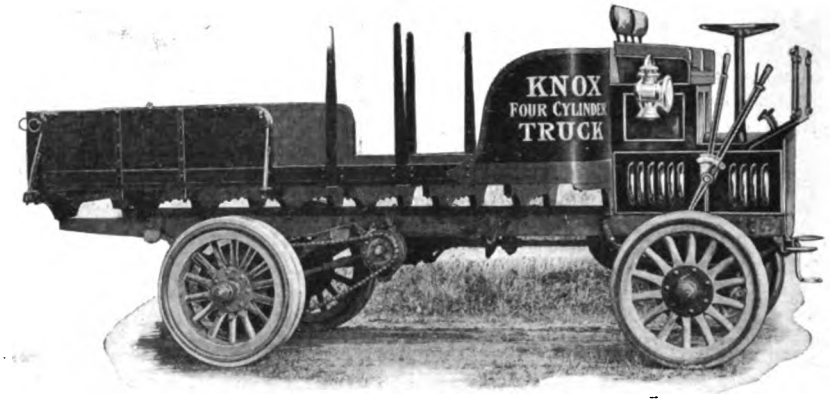
The Couple-Gear truck takes its name from the principle involved in the peculiar application of the motor energy to both sides of the wheel, and to which is attributed a very large increase in the actual amount of work which can be done with a standard battery equipment.

* * *

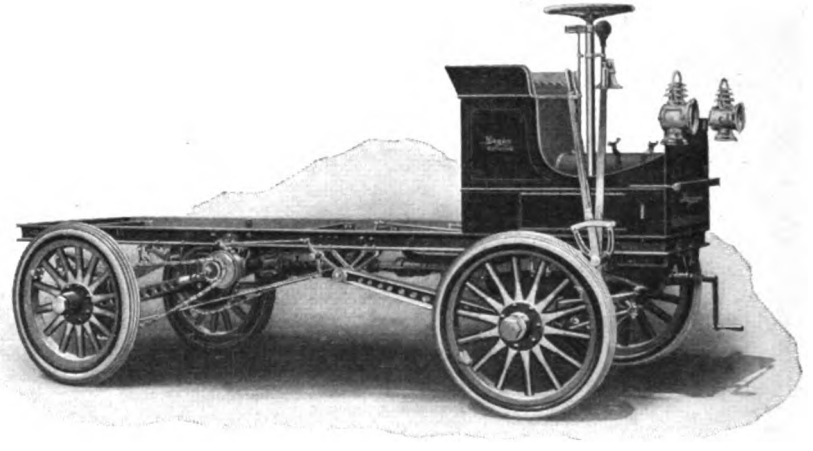
Safir Automobile Co., Zurich, Switzerland.

This firm is exhibiting a four-ton gasoline truck having many original features of construction. The singularly successful record of this model in European reliability trials gives its makers reason to hope that it will be well received in this country. All moving parts are equipped with ball bearings. The Saurer carburetor, with its astatic governor, assures economical fuel consumption and obviates sudden speed variations. The Saurer motor brake has a material influence upon the wear and tear of the tires by reason of its gradual braking effect. The Saurer self-starting appliance, enabling the motor to be stopped and started at will from the seat, has a marked effect upon the total fuel consumption as well as upon the life of the motor.

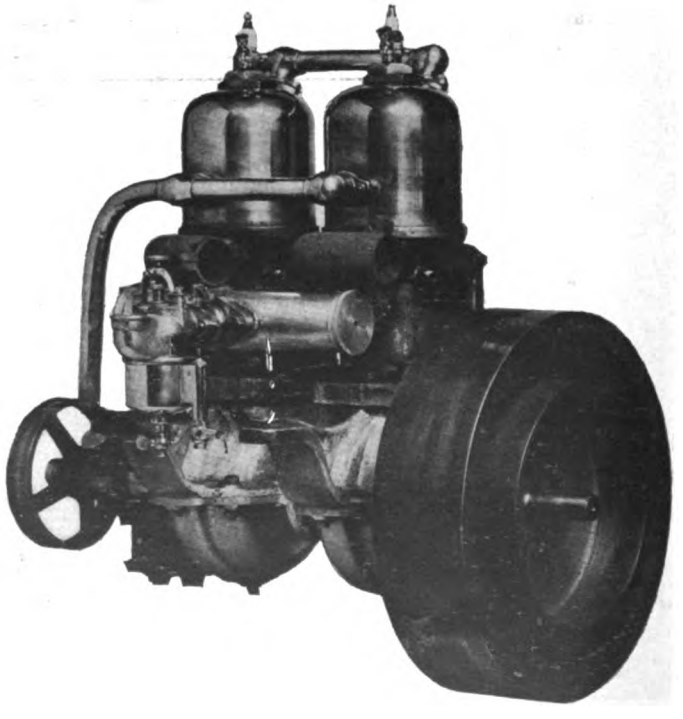
The truck is equipped with a four-cylinder, four-cycle motor of approximately 4 5-16 by 5½ inch bore and stroke, developing upward of 30 hp., European rating, at 1,000 revolutions per minute, and having magneto jump spark electric ignition.



Knox Gasoline Three-Ton Truck.



Logan Model T.



Two Cycle Engine of the Coppock Truck.

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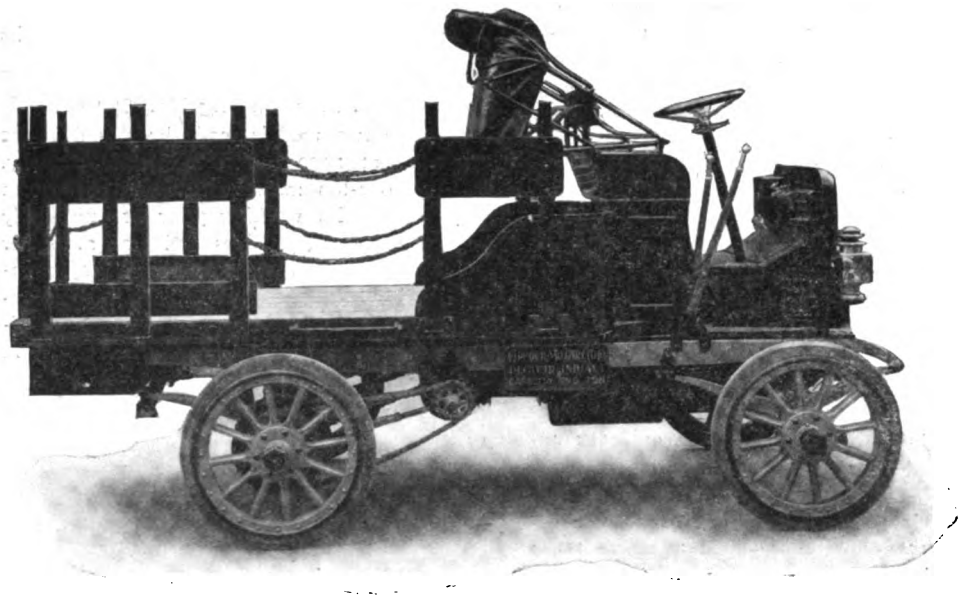
Power from the motor is transmitted through a multiple disc clutch, progressive in its action, and operated by a foot pedal. The transmission gear box is of the selective type, having four speeds forward and reverse. The rear wheels are driven by chains and sprockets from a countershaft. The power plant is mounted on a chassis frame consisting of two straight U-shaped side members of cold pressed nickel steel, reinforced by four similar cross members. The wheels are mounted on ball bearings, and in order to compensate for lateral pressure roller thrust bearings are employed. The springs, of semi-eliptic type, are of extra length to insure flexibility. The gasoline tank contains about 20 gallons and is located at the rear of car underneath the frame.

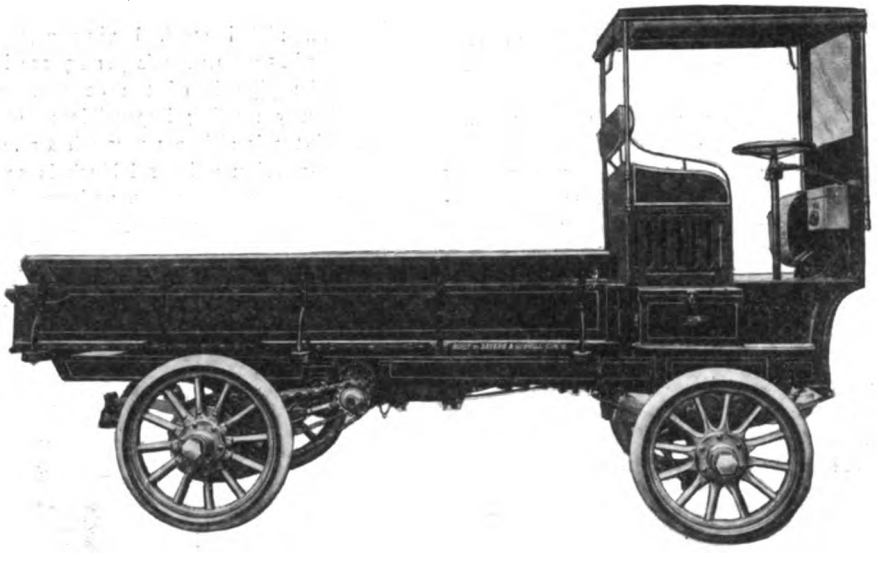
Sprags to prevent the truck from running backwards down grade are secured to the rear axle in such manner that when the sprags are down the reverse gear cannot be engaged. A steel apron protects all of the power plant from below, preventing the accumulation of dust, dirt and mud on the mechanical parts. In addition to the motor brake, two additional sets of brakes are provided, one on the countershaft and internal expanding brakes on the rear wheels.

The total length of truck equipped with standard body, 19 feet 7 inches; width, 6 feet 6 inches; wheel base, 12 feet 9 inches.

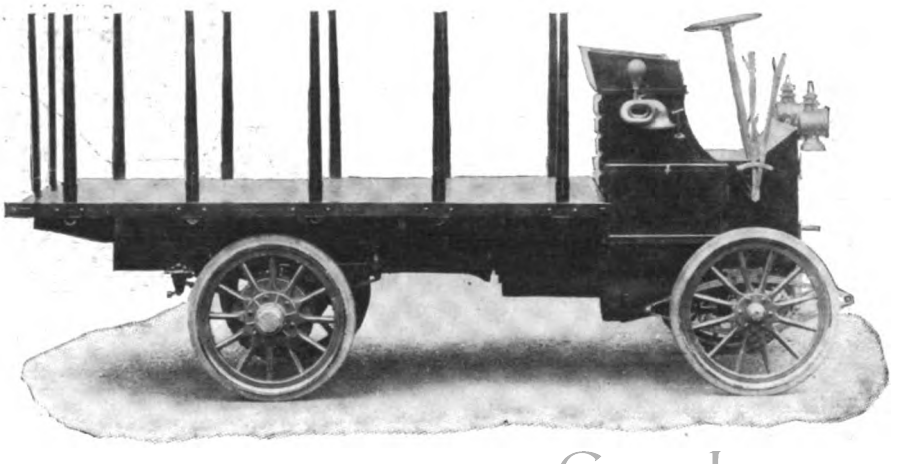
The motor is well balanced, free from vibration and noiseless. Valves are mechanically operated. The carburetor is provided with two air passages and two gasoline spray nozzles, one of which nozzles automatically regulates the quantity of explosive mixture in accordance with the power of the motor. The carburetor consequently permits of variations in the motor speed from 200 to 1,200 revolutions per minute and the speed of the truck can therefore be reduced to three miles or so per hour without changing transmission gears. The carburetor is controlled by a lever on the steering wheel. This same lever, when rotated in the opposite direction, has the function of shutting off the gasoline supply from the carburetor, opening the carburetor air passage and changing the timing of the exhaust valves of the motor with reference to the crank shaft position, thereby transforming the motor temporarily into an air compressor. In order to secure the maximum braking power, which is 75% of the motor power, the exhaust valves are opened by means of a shifting cam at the period when under the normal operating condition of the motor the explosion stroke operating would commence, and the operating cycle would follow, thus: 1, admission of air through inlet valves; 2, compression of air with valves closed; 3, opening of exhaust valves at top dead center and exhaust of compressed air, respiration through exhaust pipe under atmospheric pressure; 4, compression of air valves closed, opening



Coppock 1-ton Gasoline Wagon.



Sayers & Scovill 1-ton Gasoline Wagon.



Franklin 1-ton Gasoline Wagon.

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of inlet valve on top dead center and release of compressed air, followed by the same series of air admission, compression and exhaust. By gradually altering the timing of the exhaust the braking power can be varied at will.

The advantages of this form of braking are self-evident, the principle being the extreme flexibility of control, cooling and cleaning of the motor with fresh air, elimination of heat and wear always present in friction brakes, and the greatly reduced tendency toward skidding and side slipping.

The Saurer motor self-starter is especially valuable where traffic is congested. It consists of a water cooled air pump which may be engaged with the driving shaft of the motor through a suitable clutch, maintaining an air pressure of about 15 atmospheres in an auxiliary tank, and by means of the control lever and distributing valves starting the motor from rest on the four-cycle principle, using, however, compressed air in place of explosive mixture.

* * *

Knox Automobile Co., Springfield, Mass.

This firm makes all kinds of gasoline business wagons with carrying capacity ranging from 600 to 6,000 pounds. It is exhibiting its latest four cylinder 3-ton truck and a two cylinder 1½-ton machine. The light truck is intended for express or similar work. Its air-cooled engine develops 16-20 hp., the bore and stroke being 5 by 7. Disc clutch, planetary transmission, double chain drive, jump spark ignition, oil pump and compression grease cups, are features of its construction. The Knox system of engine cooling, consisting of grooved pins in the cylinder head, is employed. The wheel base is 100 inches. Front and rear wheels are 34 inches in diameter, with 3½ inch tires on the former and 4 inch on the latter.

The 3-ton truck is equipped with a 30 hp., vertical air-cooled engine and its speed is limited to 10 miles an hour. Its wheel base is 111 inches. Tread is 62 inches front and 65 inches rear. Wheels are 36 inches in diameter, with 4 inch single tires in front and 4 inch twins in rear. The body is 12 feet long back of the driver's seat. The body width is 68 inches. Length of body over all is 15½ feet, and width over all 7 feet. The weight of the 3-ton truck chassis is 3,600 pounds. The dead rear axle is 2½ inches square. The front axle, of I-beam section, is 4 by 2½ inches. Selective sliding gear transmission is employed, giving three speeds forward and a reverse. The drive is by countershaft and side chains to hubs of rear wheels. A metal to metal brake is placed on the shaft. Emergency brakes of like character are fitted to rear wheel hubs. Valves are located in the cylinder head. Lubrication is by force feed, an oil receptacle being placed in the bottom of the crank case. Three point suspension is used for the engine and its frame.

* * *

H. H. Franklin Mfg. Co., Syracuse.

The two models made by this firm are rated at 1,000 and 2,000 pounds capacity. The one-ton machine is driven by worm gearing. Its working parts are unusually accessible, front, sides and rear of power plant compartment being exposed by opening doors. Its four-cylinder air-cooled engine is rated at 12 hp. Rear axle is of divided type, the worm gearing being held in absolute alignment. Its front axle is tubular. Tires 32x2½ front, and 32x3 rear, are fitted. A brake is fitted to the driving shaft as well as to each rear hub. The wheel base is 76 inches. For a stake body the available platform area is 60x72 inches. Transmission is sliding gear.

The half-ton model has the same air-cooled engine as the 1-ton machine. Its front and rear tires measure 30x2½. It has 98-inch wheel base, bevel gear drive, 44x52 inch platform area. Ignition, transmission, tread, brakes and axles are as found on the heavier model.

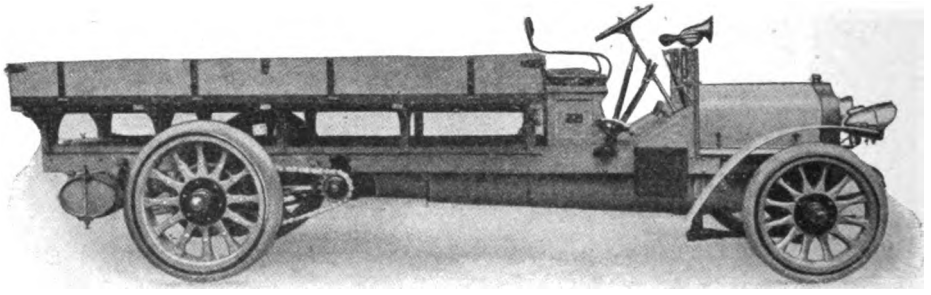
In both models the crank shaft is made of special nickel steel, having a tensile strength of 250,000 pounds per square inch. The intake pipe is of the connectionless type, thereby making impossible a change in the mixture's richness through air leaks. The transmission universal block is so designed as to prevent wear, and practically forms a unit between the engine and rear wheels. It is so constructed as to compensate any side motion or position variance. The clutch driver in its shape forms an oil reservoir and through centrifugal force oils the flywheel hub and driver. Hot burnt gases are removed so quickly and thoroughly as to reduce the temperature to the correct degree. This is accomplished by the auxiliary exhaust located at the bottom of the cylinders, and which operates mechanically. This valve is in addition to the regular exhaust valve which is placed in the head of the cylinders and is also mechanically operated. The fly wheel is of the fan type, and through its rapid revolution draws a current of air at a high velocity across the surface of the cylinders, thereby assisting in the heat removing process. The oiler is placed directly at the side of the engine base, being driven through direct gear connection with the cam shaft. The transmission gears are hardened so as to make the possibility of breaking extremely remote. The driver's seat on the one-ton model is directly over the power plant.

* * *

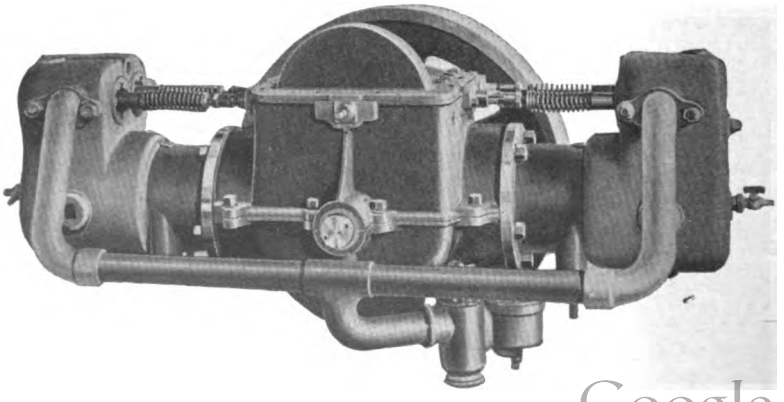
Sayers & Scoville, Cincinnati.

The 1½-ton truck made by this company is equipped with a 25 h.p. air-cooled motor having four cylinders. Its wheel base is 96 inches; tread, 60 inches. Front and rear wheels are shod with 3½-inch tires. The chassis weighs 2,600 pounds. It will take a body up to 13 feet in length, back of driver's seat, and 6 feet wide.

The motor cylinders are perfectly round, no lug or hole of any kind being drilled around their exterior surface, thereby giving a uniform circular expansion which can never bind the piston. The cooling fins are



Safir 4-ton Gasoline Truck.



Rapid Power Plant.

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2 inches deep and ⅛ inch thick at the base, tapering to 1-16 inch. These fins are ground to a true circle. The cylinders and pistons are made of composition metal, especially adapted to air-cooled work, and are run through a hardening process and finished by grinding to standard gauge. The mechanically operated interchangeable valve parts are hardened throughout. One of the important features in air-cooling is to keep a perfect compression through the valves. The valve cages and valve seats are not pocketed down in the cylinder, but are set on top, and have an extremely large air-cooling area. Any individual valve may be quickly removed for inspection without disturbing any other part. The crank shaft is hardened and finished by grinding to 1¾-inch diameter, and is accurately balanced. The flywheel is fastened with six ¾ inch collar bolts to a flange integral with the crank shaft; the 1¾-inch end of shaft, for centering the clutch, is also integral with crank shaft. The connecting rods are drop forgings, I-beam section. The crank case is of special aluminum alloy. The oil basin is divided into four compartments by ribs, insuring proper lubrication for all cylinders while ascending or descending hills. The cam shaft and lower half of crank case may be removed without disturbing the other parts of the engine.

The lubricator is of the 4-feed shooting piston type, and has a separate pump for each feed; no screws are used internally. The oiler is enclosed and has all working parts submerged in oil. It is positive ratchet driven, and forces the oil at a pressure of 755 pounds in a quantity which varies according to the speed of the engine. Sliding gear transmission is fitted, giving three speeds forward and one reverse, with direct drive on high gear. The gears are of large diameter and wide face, flange bolted to shafts and made of nickel steel. The differential is integral with the transmission. Its bevel gears have a square hole to receive the squared end of the jack shaft. The transmission is built for heavy continuous service, well proportioned and compact. Jigs and templets are used in its manufacture, insuring accuracy and interchangeability of all parts. The jack shaft revolves on large annular balls bearings enclosed in a steel casting which is directly connected with the radius rod, thereby putting no strain on the frame. The clutch is of the internal expansion type, 15-inch diameter, faced with leather reinforced with 200 hickory pegs, and revolves on a roller bearing.

The steering gear is irreversible operated by worm and nut. The small self-finding gear shift lever is situated under the hand wheel, thus enabling the operator to shift gear without changing his natural vertical position. Two pedals are used; the outer first disengages the clutch and then applies the emergency brake; the inner first disengages the clutch and then applies the light running brakes. The spark and throttle levers are situated in center of hand wheel. Springs are half-elliptic in front, 2¼ inches wide. The rear springs are platform, 2½ inches wide; cross spring, 2½ inches wide. The front axle is of 2½-inch I-beam contstruction and does not require the usual bend in center, giving greater road clearance. The rear axle is stationary, 2¼ inches solid square.

The frame is constructed of 2x5-inch ash, armored by ¼ by 5-inch steel. Two independent sets of brakes are used. They are of the contracting band type. The regular light running brakes are of such size as to prolong the life of the tires. They are situated on the side shaft, and, as their adjustment cannot be affected by the radius rod, they always remain the same. The emergency brakes are on the hubs of rear sprockets. The twisting action produced by the emergency brake is transmitted to the radius rod, thereby relieving the springs of this strain. Both sets of brakes have long equalizers. The drive is by side chains.

* * *

Coppock Motor Car Co., Decatur, Ind.

This firm, now located at the address above given, is exhibiting a one-ton gasoline truck fitted with a two-cycle engine having 4½-inch bore and 5-inch stroke. The engine is of the three port type, with vertical cylinders separately cast. The cylinders are machined on the outer surface to maintain perfect roundness under all conditions, even cylinder wall thickness insuring even expansion and contraction. The lubrication of pistons and connecting rod is positive by force feed oiler gear driven in the following manner: One oil pipe leads to a boss on the side of the cylinder, leading to a groove on inside of cylinder 3-16 inches wide and 1-8 inch deep. This groove is cut from one side of piston pin, extending around to the opposite side. In this manner it entirely surrounds the piston except the width of the pin, which is 1⅛ inches. On the movement of the piston this groove is not uncovered, but comes to ⅛ inch of each end of the piston on its up and down stroke. In this manner the piston and rings are always well lubricated, with absolutely no waste of oil. For the lubrication of the connecting rod the piston pin is hollow two-thirds of the way through. The second oil lead registers with this hollow end. The piston pin is drilled, so that when the crank is in vertical position oil is fed to the upper end of the rod. When the crank is in horizontal position the oil hole is drilled in pin to register with the tube fastened in the channel of the connecting rod, which leads to its lower end. After the car was in service for two months the lower crank case was drained to see what quantity of oil was wasted, and less than one ounce was found in each compartment.

The crank journals are fed by hard grease cups placed upon the dash in plain view of operator, and lead to engine in ⅜-inch copper tubing. The great advantage of these cups on dash are: first, operator will not neglect them as they are always in sight; second, they are away from heat of the engine, and the grease will always remain in firm condition. Piston rings are the Cartwright steam packing pattern. The outer ring is ⅝ inches wide, ⅛ inch thick, split at 45 degrees. Two rings under this master ring are 3-16 x ⅛ inches, eccentric 5-16 inches wide. All rings are pinned by one pin passing through the lap of the master ring, and between the two eccentric rings. There is an allowance made of 1-16 inches in depth of ring groove over the two ring thickness for lubrication. With this arrangement of the rings and lubrication, after exhaustive tests were made, no signs of carbon deposit in ring grooves were shown, which is so common with 2 cycle motors.

The crankshaft is 30-point carbon steel, hand-forged, carrying a 5½-inch flange for bolting on the balance wheel. It is finished all over, the main journals being ground to size. The bearings in the lower end of the connecting rods are split in the usual manner, but they overlap each side of the rod the same as in steam engine practice with wrist pin bearings. They are pinned with a 3-16 inch pin in each half to keep from rotating in the rod end. These dowel pin holes in all bearings are drilled with special jigs so as to insure perfect fitting for renewals. The expanding bronze ring clutch acts within the small diameter drum on the rear face of the flywheel. This drum has a diameter of 10 inches and a width of 2¼ inches. To insure gradual clutch engagement, with an absence of gripping, a series of cork inserts is used in the bronze band, these cork portions forming 8 per cent of the band surface.

The frame is made of 11-64 nickel steel, cold pressed. The front springs are 40 inches long. The rear side springs are 48 inches long. The rear cross spring is 38 inches long. The front axle is of 1¾-inch I-beam pattern. The bed is of forged nickel steel. The rear axle is a 1¾-inch nickel steel forging.

The steering gear is of worm and sector type, with spark and throttle control on top of hand wheel. The transmission, of progressive spur gear type, gives three forward speeds. The gears are formed of hardened nickel steel and made with 1-inch face and six pitch. The bevels for transmitting to the jackshaft are made from the same metal, but have four pitch. Final drive is by means of two side chains from jackshaft to rear wheels. The wheel base is 87 inches. All wheels are 32 inches diameter. Front wheels are fitted with 3½-inch solid tires, rear wheels with 4-inch tires. Brakes of external band type are carried on the cross countershaft.

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Brush Runabout Co., Detroit.

This company fits a light delivery body to its 6 hp. single cylinder gasoline runabout chassis. The frame and axles are of wood. There are two forward speeds and a reverse. The drive is by shaft to countershaft and hence by double side chains. The transmission consists of tooth action between an internal and external gear. Its operation is on the planetary principle, but there are no brake bands, their place being taken by metal clutches so arranged that wear on the surfaces takes itself up.

The accessibility of the engine is very noticeable. The spark plug can be removed for inspection or cleaning in ten seconds without disconnecting the wire. The valves can be taken out in half a minute. The connecting rod bearings can be laid open to view and for adjustment in half a minute. The head of the cylinder screws in and can be unscrewed for the purpose of inspecting the cylinder and piston. In about three minutes the piston and connecting rod can be taken out through the top of the engine without disturbing a pipe, wire or connection. The gasoline adjustment of the carburetor is by a little lever on top. The entire power plant can be taken to pieces and put together again without once kneeling or lying down on the floor. The only thing which is under the body of the car is the transmission and lever connections.

The fuel system is so arranged that in case of a leak in the pipes the gasoline will all flow back into the tank instead of on the floor. The carburetor has no float or moving part aside from the air valve. The springs are spiral, located at the four extreme points. This gives a wide engine base, at the same time does not interfere with the turning radius. The frame is hung from the bottom of the spring, while a pin attached to the top of the spring runs down to a socket on the axle end. In going over a bump, when the frame goes down, the spring opens, and on the rebound simply closes together. Before the spring can open beyond its limit of elasticity the frame would strike a bumper on the axle end. In connection with each spring is a friction-joint radius rod, which by means of its friction is also a shock absorber, dampening the motion of the springs. It is this feature which, in combination with the wood axle, makes the solid tire possible. The spiral springs take the small bumps and the friction radius rods the large ones. The axles are of wood, prepared by being oil soaked before assembling.

* * *

Pope Motor Car Co., Indianapolis.

The exhibit of this firm consists of two 1,200-pound electric delivery models, one closed and the other open, an electric express wagon, and an electric one-ton truck. The manufacturing range of the company is from light wagons to 5-ton trucks.

The specifications of the one-ton truck are as follows: Wheel base, 92 inches; tread, 68 inches; wheels, 36-inch front and rear, fitted with 3-inch tires; platform, 13 feet long by 4½ feet wide; two motors hung from body in front of rear axle; sector and pinion wheel steer; battery, 43 cells 11 m. v.; length over all, 15 feet; width over all, 7 feet 2 inches.

The specifications of the 1,200-pound delivery wagon are as follows: Wheel base, 7 feet 7 inches; tread, 5 feet; single motor, double reduction; double side chain drive; hub and countershaft brakes; wheel steer; wheels, 32-inch front and 36-inch rear, fitted with 3-inch tires; battery 42 cells of 11 p. v.

ANOTHER GASOLINE-ELECTRIC ROAD TRAIN.

IN various parts of the world there are signs of increasing interest in the development of the motor road train. The unequivocal success of the Renard train, which is drawn by a gasoline locomotor, and its remarkable demonstrations in heavy haulage, seemingly have inspired a number of firms already engaged in industrial motor vehicle manufacture to produce something of like character. Bussing, German manufacturer, who is ranked high as a producer of motor buses and heavy wagons, is now at work on the design of a 50 hp. gasoline-electric tractor for service in the army. Motors on each trailer furnish power to each driving wheel, side chains connecting the wheels to differential countershafts. If this model works satisfactorily another with 100 hp. will be built for the German military authorities.

Berlin now has 546 motor cabs of all kinds. Recently the city authorities were petitioned by the operating companies to refuse further licenses either to new or old companies. The petition was denied, the police department, which issues licenses, declaring that the number of cabs in service corresponds to the needs of traffic, adding that if cab proprietors were not thriving it was not because of a superfluity of machines.

During eight months of the present year Germany exported $546,400 worth of industrial motor vehicles. No effort is being spared to push this branch of German automobile endeavor.

PROFIT IN SIGHT-SEEING VEHICLES.

SIGHT-SEEING motor vehicles when in the hands of intelligent operators can be made to pay fair interest upon the investment they represent. The financial history of the American Sight-Seeing Company would seem to corroborate this statement.

This company operates in New York, Philadelphia, Boston, Washington, Denver, Salt Lake City, Los Angeles and Jacksonville, Fla. It was organized five years ago. In its first year it paid a dividend of 2 per cent to its stockholders, 4 per cent the second year, 5 per cent the third year, and 4 per cent the fourth year. The dividend in the fourth year would have been larger if it had not been deemed necssary to buy more equipment out of the net earnings. The company is capitalized at $500,000. It has no indebtedness.

The company has trading connections with the railroads, steamship companies and others who extend excursion rates to the traveling public, tickets for transportation usually containing one or more stubs which entitle the holders to seats on the motor vehicles.

The majority of the company's stock is held by well-known business men in New York City and by such concerns as Lord & Taylor, Steinway & Sons, A. A. Van Tine & Co., Park & Telford, Pope Manufacturing Company, Scott & Browne, August Luchow, Edward M. Knox, Herring-Hall-Marvin Safe Company, Charles R. Fleischamn, John B. Martin, Louis Martin (Cafe Martin), Kinsley & Baumon (Holland House), R. Hudnot (chemist), Edward Pinaud, J. K. Stafford, Marks Arnheim.

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Mitchell's 1-ton Truck at End of Its 1,168 Mile Reliability Test.

Arduous Test of Reliability

Record of Long Overland Trip by Heavily Overloaded Mitchell Truck

MUCH information is now available concerning the haulage of merchandise by motor wagon from the interior to the eastern seaboard under road and weather conditions more severe than are ever likely to be encountered by those who may be pondering the utility of the machine in long distance transportation. It is obtainable as a result of a trip made by a one-ton Mitchell gasoline wagon which was overloaded more than 50 per cent.

The journey which began at Racine, Wis., and ended at New York city, extended over 1,168 miles and was accomplished at a bare operating expense of $39.40, or .03373 of a cent per mile. The elements of which this expense was composed stand as follows:

132 gallons of gasoline.....	$26.40
16 gallons of lubricating oil.....	12.00
10 pounds of hard grease.....	1.00
Total	$39.40

It would, of course, be idle to pretend that a ton and a half of merchandise could either be occasionally or regularly transported by road at the cost above given. Driver's wages, repairs, storage charges, and all the other items which have to be considered in practical accounting are temporarily ignored, in order that it may be seen how comparatively inexpensive and few are the wants of a motor wagon. It actually appears that the machine in question could have transported its own supplies as well as its load. Had it done so, the bare operating cost would have been cut square in two, for no automobile factory pays such prices for fuel and lubricants as were debited against the machine while in transit. Gasoline, charged for at the rate of 20 cents a gallon on the trip, could easily have been taken from stock at a little more than half that price. Lubricating oil at 75 cents a gallon, and hard grease at 10 cents a pound, represent much higher prices than motor wagon makers are in the habit of paying for private consumption. But the desire to be fair in the accounting prompted the Mitchell company, in this as in all other matters pertaining to the wagon's record, to exercise extreme conservation.

* * *

The wagon, taken from stock and not in any unusual way prepared for the hardships it was fated to encounter, set out with a paying load of 3,400 pounds, a driver and one passenger. This, as has already been intimated, imposed more than 50 per cent overload on the machine which, considering the woeful condition of the highways from start to finish, furnishes eloquent proof of the substantiality of the engineering design. It was raining when the wagon took its departure. While it was making its way through New York state the driver ascertained that rain had fallen for twenty-one consecutive days. As it drew into Toledo the owners of half a dozen touring cars, beleaguered by reason of the bad condition of the roads, were amazed to see a motor wagon boldly proceed on a course which they regarded as impassable. As if these impediments to progress were not enough, the pilot of the

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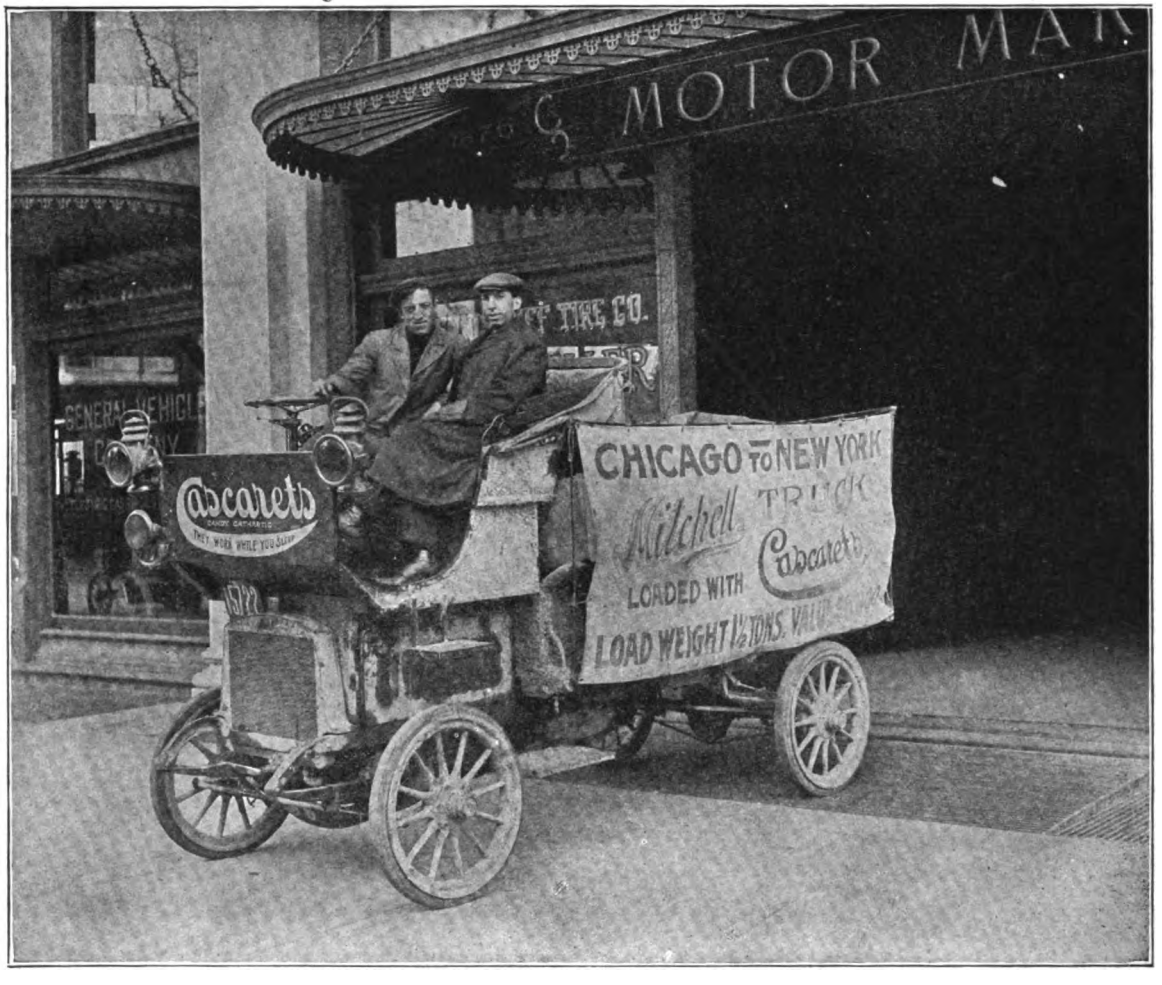
This Truck Carried a Load of 3,000 Pounds

(PLUS THE WEIGHT OF THE TRUCK—2,300 LBS.)

from Chicago to New York In October



Morgan & Wright Tires were used, and the best proof of their behavior is contained in the statement of the Mitchell Motor Co. regarding the trip (see opposite page).

These tires are made in both single and twin styles, and in sizes to accommodate any type of vehicle from the light delivery wagon to the heaviest truck, and from the Victoria, coupe or brougham to the largest sight-seeing car.

Made from stock specially-compounded to meet the severe requirements of truck service. Write us concerning your requirements.

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Here Is What the Mitchell Motor Co. Say of the Trip:

CUSTOMERS CARS ARE ONLY DRIVEN BY OUR STAFF AT CUSTOMERS OWN RISK AND RESPONSIBILITY.

Telephone 5235 Columbus

Mitchell

Mitchell Motor Co. of N. Y.

1876 BROADWAY

NEW YORK, October 17, 1907.

Messrs. Morgan & Wright,
New York, N. Y.

Gentlemen,-

You may be interested to know that on the trip just completed by the Mitchell 4-cylinder truck from Chicago to New York it was equipped with Morgan & Wright solid motor tires.

This truck carried a dead load of three thousand (3000) lbs. of merchandise in addition to the weight of the truck which is twenty-three hundred (2300) lbs. The distance traveled was 1157 miles over roads that were for the most part very rough and heavy with mud. The tires gave excellent satisfaction and show but little sign of wear after their long and strenuous trip.

Very truly yours,
Mitchell Motor Co. of N. Y.
Chas. P. Skinner,
President.

CPS/FRM

If that kind of service appeals to **you**, you can **have** it by using the kind of tires the Mitchell Co. use.

MORGAN & WRIGHT, DETROIT

SPACE 26-27 CHICAGO SHOW

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expedition had the misfortune to learn, upon reaching Buffalo, that the state road from that point to New York city, which it was hoped would afford good footing, was undergoing repairs over the greater part of its length, necessitating detours on highways which were crusted, centered and bottomed with mud.

And what was the purpose of this extraordinary journey, so unexpectedly attended by such malign conditions? Simply to determine the reliability of the wagon in action. All other results were to be subordinate to this. If the wagon possessed any element of weakness it was certainly more desirable that it should be discovered by its authors before it betrayed the expectations of those who employed it in commercial duty. It was nothing that the time consumed on the trip was double what was expected at the outset. The experience sought was gained with difficulty, and in the future will prove immeasurably valuable. Indeed, already the experience of the journey has yielded profit, for after the company had examined all the reports of its driver and observer it decided to equip its future product with a very much stronger transmission than that hitherto used.

* * *

Ordinary interest in such a remarkable performance demands that a full list of expenses be given, and those skeptical of the economy or reliability of motor wagons might here suppose that the pride exhibited in this narration would be humbled. Nothing of the sort. The machine behaved splendidly. Aside from the cost of repairing the transmission, re-setting a tire, and necessary charges for storage and washing, the expense was insignificant. Further than this, when the machine was overhauled upon returning to Racine the wear of working parts was found no greater than might have been anticipated after such an arduous experience as the wagon had come through. To gratify curiosity we append the charges in the matters just mentioned:

Re-setting tire	$ 5.00
Repairs to transmission	18.00
Storage and washing	21.00

The wagon averaged 8.848 miles on a gallon of gasoline and 73 miles on a gallon of lubricating oil.

THREE TON PETROLEUM WAGON.

MUCH professional curiosity was evinced in the performance of a 3-ton wagon which completed the prescribed course of the five week trials recently held in England. This was due as much to the fact that the machine was fitted with a low speed engine which used paraffin for fuel as to the other important fact that it contained but a single cylinder and was otherwise generally designed in an extremely simple manner.

In appearance this wagon did not strike the observer as being particularly attractive, but it was remarked that at the end of each day's journey it reached the point of destination without having been penalized to a greater degree than any of its more imposing and orthodox competitors. It performed the duty expected of it, and even did so with distinction.

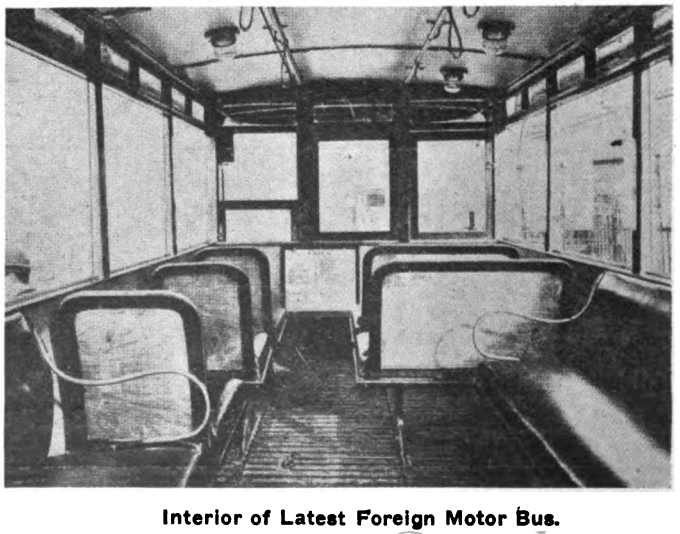
The engine of this vehicle is rated at 26 hp. It is of the horizontal type, fitted with low tension magneto and accumulator and coil ignition. It is single chain driven and has but two forward speeds. It is fitted with steel tires and weighs 5,900 pounds.

The engine cylinder of this interesting machine is of 8-inch diameter. The stroke is also 8 inches. At normal speed of 650 revolutions per minute 20 hp. is developed. The vaporizer is really a pocket in the combustion-head, and the paraffin is admitted during the stroke previous to that at which it is fired. It is sucked in with but a small quantity of air, the main air supply entering later through a special valve. The inrushing air does not, therefore, cool the vaporizer. There is no carburetor, or spray chamber, but simply the pocket in the combustion-head already mentioned, and in that, after its arrival by suction, the paraffin is vaporized. The ignition lever and plug are also fitted into the vaporizing chamber. Half-compression gear is fitted.

The crankshaft is made of vanadium steel, which gives a tensile test of 37 tons per square inch, and an elongation of 25 per cent on 2 inches. A very heavy flywheel is fitted, and to that fact is due much of the success of the vehicle. There are so few parts in the engine, which is most accessible, that it occupies but a short time to take out the piston and connecting-rod for examination. The clutch is of the metal to metal cone type. Projecting from the male cone are two lugs through which two drag bolts are passed. The drive is transmitted through these bolts and a compression spring to the central member, through which a square hole is drifted to take the end of the gear box shaft. In this manner clutch and spring drive are practically and simply combined.

The gearing, of ample width to stand continuous heavy wear, is always in mesh. The forward speeds are 5 and 8 miles per hour, with single reverse speed of 3 miles per hour. The rear axle is solid, made of vanadium steel, and is 3½ inches in diameter. The front axle is built up of channel steel with forged ends.

The cost of operating this wagon is very low. The machine is intended for rough service in city or country.



Interior of Latest Foreign Motor Bus.

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FACT VERSUS FICTION.

THE omnibus companies are abandoning the big motor vehicles which have cost them so much and reverting to the use of the crawling contrivances pulled by horses. This is the burden of every transatlantic letter sent by correspondents of our metropolitan dailies.

Of course, the statement is untrue. The records prove that. A year ago at this time there were 754 motor buses in service in London. Today there are 917, distributed as follows:

Vanguard Motor Bus Company	372
London Road Car Company	210
London General Omnibus Company	202
Great Eastern Motor Omnibus Company	55
Thomas Tilling	36
Miscellaneous owners	42
Total	917

CONCERNING TRAFFIC CONGESTION.

SUBWAYS are the true solution of street congestion, says the Chicago Journal. Maybe so.

But when the subways become congested, what relief may be expected?

Already Chicago's subway is choked with traffic, but that fact does not seem to lighten the surface conditions. The truth is, traffic grows faster than relief means can be provided, and will continue to do so until the number of commercial vehicle units is lessened by the substitution of power wagon for draft animal transportation.

SIGHT-SEEING CAR REGULATIONS.

POLICE regulations which will govern sight-seeing automobiles are to be adopted in Washington, D. C. It is proposed that no vehicle of this character shall stop at any place other than a public vehicle stand for longer than 15 minutes at one time, nor thereafter until the expiration of one hour. Only one office is to be permitted proprietors of such machines and only one car is to be allowed to stand in front thereof.

There are ten companies operating sight-seeing cars in Washington.

MOTOR HOSPITAL BUSES.

FOR the transfer of convalescing fever patients from one hospital to another, and for the removal of imbeciles and children to institutions set apart for their use. the Asylums Board in London has long employed five mo for buses, and now want two more. The total carrying capacity of these machines is 108 adults.

In defending the employment of these machines the ambulance committee recently stated that to transport the same number of patients by horse-drawn buses would necessitate the use of 13 such vehicles and the maintenance of 40 horses, 23 men and 13 nurses. With five motor buses the pay roll is as follows: Five drivers, 5 attendants and 5 nurses.

WAGONS AT THE SECOND EASTERN SHOW.

ALTHOUGH there were more industrial motor vehicles at the second New York show than at the first, yet the display was far from being representative. The following firms showed machines:

Hewitt Motor Co., New York City, 5-ton gasoline truck equipped with four cylinder 28 hp. engine; Alden Sampson Mfg. Co., Pittsfield, Mass., gasoline-electric road train consisting of tractor and two trailers; General Vehicle Company, Long Island City, N. Y., 1,000 pound delivery wagon, 3½-ton truck and 5-ton truck, all electrically operated; Knox Automobile Company, Springfield, Mass., 3-ton truck with 30 hp. four cylinder air-cooled engine, 1½-ton truck with two cylinder air-cooled engine rated at 16-20 hp.; Pope Motor Car Co., Indianapolis, light delivery wagon and express wagon, both electric; H. H. Franklin Mfg. Co., Syracuse, N. Y., stake truck fitted with four cylinder air-cooled 16 hp. engine; Cadillac Motor Car Co., Detroit, Mich., light delivery wagon with single cylinder 10 hp. motor; Baker Electric Co., Cleveland, Ohio, electric police patrol wagon, the chassis of which can be fitted for commercial work; Champion Wagon Co., Owego, N. Y., electric wagon with 750 pound capacity; Studebaker Automobile Company, South Bend, Ind., one omnibus, one light delivery wagon and a truck, all electric.

Such of these exhibits as have not already been described in this paper will be treated in the description of the models appearing at the Chicago show.

GERMAN RELIABILITY TRIALS.

OUT of 52 machines entered in the German reliability trials 28 completed the 332 mile course without penalty. The classes represented included single decked buses, delivery vans, and light and heavy freight wagons. Each vehicle carried a weight of sand equal to its rated useful load. For every involuntary stop exceeding five minutes a penalty was imposed. Representatives from the military transport department were present throughout the trials.

The speed at which some of the machines were driven called for sharp criticism. Vehicles fitted with steel tires, and carrying five-ton loads, were often speeded to 15 miles an hour. Two machines used benzol for fuel. The power of another was developed by a gasoline engine and transmitted electrically. Two machines were fitted with friction disc drive. Cast steel wheels predominated among heavy machines.

ANOTHER FIRM TO MAKE MOTOR WAGONS.

WITH capital of $75,000 the Carlson Motor Truck Company has been organized to engage in the manufacture of heavy duty commercial vehicles. The factory will be located in Brooklyn, N. Y. The company is not yet ready to announce its plans.

The makers of the Renard road train have sold the right of use and manufacture in India, Burmah, and Ceylon to a concern capitalized at $150,000.

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NOISELESS STREETS.

WILL the traffic of the future be noiseless? The question is asked in all seriousness, and an answer is demanded in view of the great outcry which is being made both here and abroad over the din and clatter which seem inseparable from increasing commerce in large centers of industry.

Rubber covered streets have been suggested in abatement of the nuisance. The experiment of employing such a sheathing for traffic surfaces has already been made, notably at the approaches to railway termini in London where vehicles of all kinds abound and the uproar was ear-splitting until allayed in the manner indicated. Perhaps the most interesting feature of these experiments is the manner in which the rubber carpet withstands the heavy traffic to which it is subjected. Its resistance to destructive forces is little short of marvelous. It gives splendid traction and is not readily affected by compression. Nor does it seem to show much deterioration from exposure to the elements or from substances ordinarily supposed to be foes to rubber. Its first cost, however, is high—prohibitively high for general use.

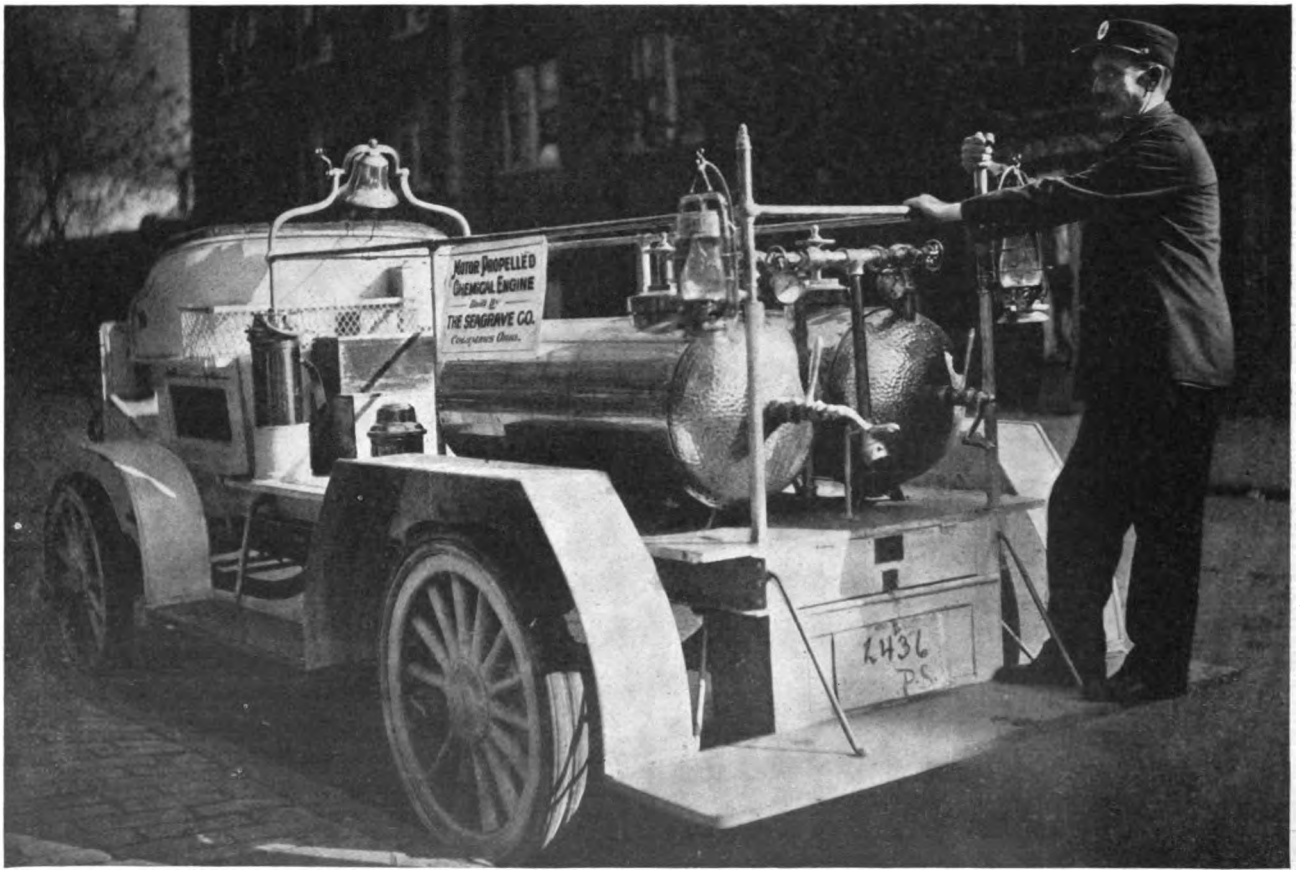
It is yet too early to draw conclusions from the scant evidence furnished by the few spots on the face of nature which are so overlaid. When it is definitely known how the rubber covered street compares with other street surfaces in such important matters as wear, maintenance, sanitation and so forth, it will be time to advocate or oppose its introduction. Given endurance, it should suit motor vehicle traffic. Horses, however, might be expected to paw it to pulp.

MOTOR CABS FOR CHICAGO.

EARLY next year Chicago will be supplied with taximeter motor cab service by a company which has been organized for that purpose. The Chicago Taximeter Motor Cab Company, capitalized at $50,000, will put 100 gasoline vehicles of the landaulet type, closed in winter and open in summer, on the streets as soon as they can be obtained from the builders. The cabs will be made by the Cadillac Motor Car Company, of Detroit.

It is understood that the manufacturers have a controlling stock interest in the operating company. If this is the case the public has cause for congratulation, for it is a sign that the vehicles will be maintained and operated in a manner calculated to be of credit to the enterprise.

A French automobile maker is publicly urging the makers of motor cabs for Paris service to place the steering column on the left side of all vehicles. In Paris the traffic circulates on the right side of the road, as it does with us. In England it circulates on the left, and on this account it is proper to put the steering column on the right hand side of the machine. Fewer accidents would occur in crowded traffic if this suggestion was followed.



Rear View of 40-hp. Motor Chemical Engine

Built by Seagrave Co., Columbus, Ohio, fitted with Frayer-Miller air-cooled engine. Maximum speed, 40 miles an hour.

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SIGNIFICANT EAGERNESS.

WHILE the executives of our large cities are academically considering the importance of supplementing the present type of horse drawn fire apparatus with self propelled machines it is curious to note that their contemporaries in many relatively small but progressive communities, unhampered by tradition or formidable investment, have set to work with characteristic American energy to replace the old with the new equipment.

In some small towns and cities money is being raised by popular subscription for the purchase of motor driven first-aid vehicles; in others funds are being privately secured for the acquisition of motor fire engines. The citizens of these enterprising communities realize that the value of a fire department almost exclusively consists in its ability to prevent the spread of a conflagration, and are willing to contribute from their own means in order to insure better protection against loss than the municipality can afford to extend.

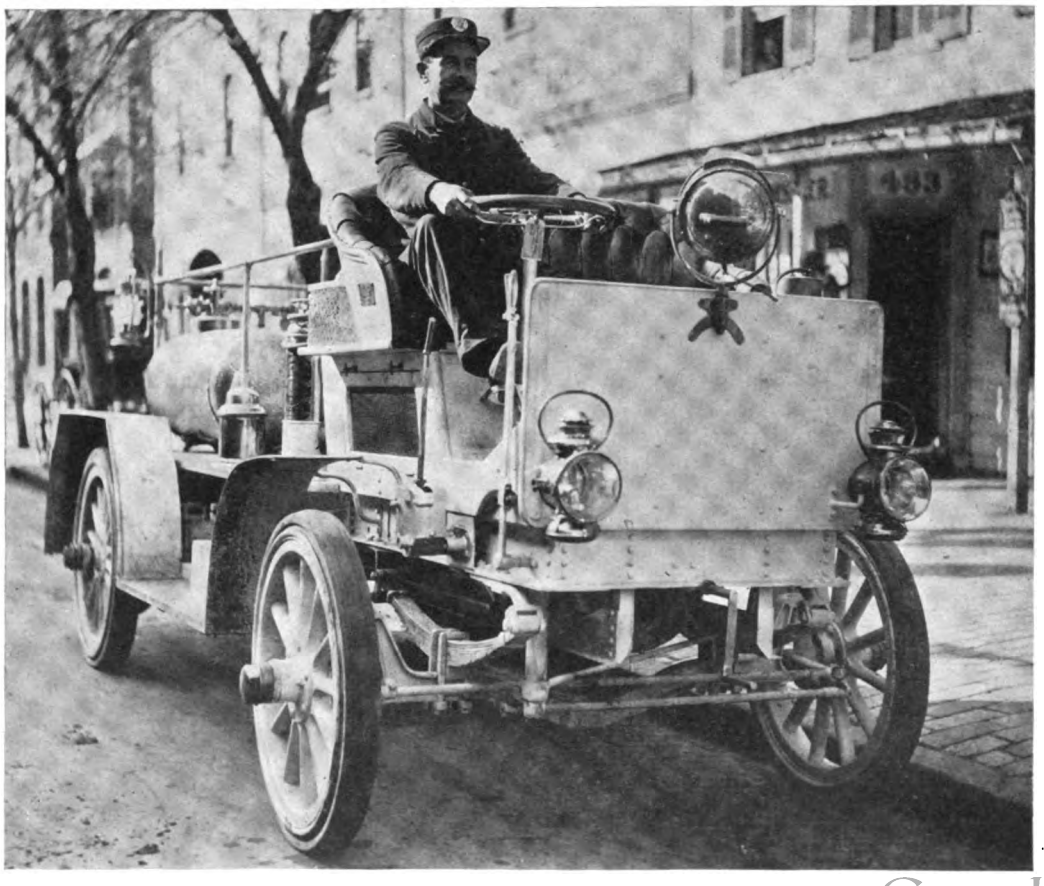
What is taking place in Hayward, Cal., is typical of what is occurring in many small cities throughout the country. The people of Hayward want a combination motor hose cart and chemical engine to carry 15 men. They believe it can be purchased for $2,500 or $3,000. After a campaign of two weeks the fire chief has secured permission from the relief committee of San Francisco to use a balance of $557 now lying in one of the banks of that city. In addition to the amounts received from private subscription the fire department has arranged for a series of entertainments which it is hoped will net sufficient to enable them to get the new truck by the first of the year.

The Business Men's Association of the city has agreed to give an entertainment some time during the present month, the proceeds of which will also go toward the same end. With some slight aid from the town trustees, and the proceeds of a Thanksgiving eve ball, the balance of the necessary sum will be forthcoming.

Pending the construction of a trolley line a motor bus service will be established between Tulsa, Ind., and the outlying college grounds. The highway is to be put in first class condition and oiled.

The French army department, following the lead of the British military authorities, is compiling a list of industrial motor vehicles which might be impressed for transport service in time of war.

Now it is the turn of the antarctic explorer to relate how he proposes to pierce the southern polar region in a motor wagon, the rear wheels of which are shod with iron spiked tires, said spikes being screwed into holes in the periphery. The front wheels are mounted on ice runners. An air-cooled 15 hp. engine supplies power for propulsion.



Front View of 40-hp. Motor Chemical Engine.

Built by Seagrave Co., Columbus, Ohio, fitted with Frayer-Miller air-cooled engine. Maximum speed, 40 miles an hour.

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MOTOR HEARSES FOR NEW YORK.

PREJUDICE against the use of the motor hearse is gradually being broken down. After all, its utility had only to be demonstrated in order to silence criticism, which never was formidable. It's novelty will soon be forgotten.

Although undertakers in several European cities have been making use of motor hearses for some time past it was not until lately that anyone could be found in this country with courage enough to brave public opinion by following foreign example. A funeral director in New York, however, having decided to ignore public prejudice or private business scruple and consider only the convenience and utility of the motor hearse, evolved a design which is as radical in conception as it is rational in character. It is a combination hearse and mourners' vehicle.

At first thought it might appear that this was carrying novelty too far, but when it is recalled that the service of funeral cars on steam and trolley lines is now accepted without hesitation there can exist no sound reason for supposing that an adaptation of the same practice to road mortuary vehicles is not fully justified.

Probably as time wears on the motor hearse, with seating accommodations for the relatives of the deceased, will appeal with peculiar force to many who are unhappy enough to require its services. Funeral coach hire from residence to cemetery and return is a heavy drain upon the purse of many a family which has striven hard to provide money for doctors, nurses, medicine and, last of all, the casket. Such thoughts undoubtedly influenced the New York undertaker in planning the design of his combination hearse. In many ways his vehicle expresses a praiseworthy sense of propriety. Beneath the body of it is a compartment for the dead.

The vehicle is operated by a two cylinder gasoline engine. Friction disc drive is employed. The engine is placed in the usual position; in fact the fore part of the vehicle, from the driver's seat forward, is similar to that of the ordinary automobile. The underslung compartment for the dead and the covered body for the mourners are the only two external features to distinguish its design.

The undertaker's business wagon and ambulance, which are customarily employed in a variety of duties less conspicuous than is assigned to a hearse, are now common enough. Ever since the biggest burial casket manufacturing firm in the country bought machines for hauling its merchandise a couple of years ago, the more prosperous undertakers have been impressed with the necessity for using similar vehicles in their professional work. Not a few of them make use of the decorous electric wagon, although recently the gasoline machine has been sought by those who possess no facilities for charging the electric wagon and have need for the greater range of the other type.

The motor cabmen of London have formed a protective union.

One of the most profitable motor stage lines in the country is that connecting Melrose with Tucumcari, N. M.

MOTOR CABS IN NEW YORK.

TAXIMETER motor cabs continue to increase in popularity in New York City. There are now two concerns operating these vehicles, the New York Transportation Company, which uses electric and imported gasoline vehicles, and the New York Taxicab Company, which exclusively operates imported gasoline machines. The latter concern is one of the subsidiary companies of the New York Motor Cab Company, where stock of $1,300,000 is controlled by foreign investors.

The Touring Car and Taxicab Service Company is the title of another concern recently organized by Thomas Reed, a lawyer whose father is a member of the stock exchange; Richard Gordon, another stock exchange member; and Louis H. Matthew, a physician. These gentlemen are, respectively, president, vice-president and general manager of the company. The manager of an automobile importing agency is one of the directors, which perhaps accounts for the fact that the company is to use 125 Renault gasoline cabs of 10 hp. Service, it is expected, will begin January 1. The company is capitalized at $1,000,000.

The gasoline cabs operated by the New York Transportation Company are of Delahaye manufacture. Their running gear is painted yellow. Their bodies are olive green. The upholstery is in black leather. They are of landaulet type. The wheel base is 101½ inches. The frame is of pressed steel. At 1,000 engine revolutions the vehicle has a road speed of about 21 miles an hour. The chassis weighs 1,300 pounds. The cab can be turned in a 19-foot circle.

The New York Taxicab Company's machines are made by Darracq in France. They are being imported at the rate of 75 a month. Their running gears are painted green. Bodies are red. The upholstery is tan colored. They, also, are of the landaulet type.

Both of the two companies which are actively operating charge the same fare, namely, 30 cents for the first half mile or fraction thereof, 10 cents for each succeeding quarter mile, and 10 cents for every six minutes of waiting. The Darracq machines are found in greatest numbers in front of the hotels.

JAPAN'S AWAKENING.

JAPAN is slowly awakening to the importance of commercial motor road transport. Motor buses have been imported from France to operate in Tokyo. Inspired by the example of a company formed to distribute merchandise by means of motor wagons in Tokyo and the surrounding district, three other companies have applied for similar privileges, one to operate between Yokohama and Hayama via Kamakura and Dzushi, where Yokohama people have summer houses, another from Kanagwa to Kanazawa via Sugita, and a third from Kanagawa to Kawasaki, Kanagwa being on the outskirts of Yokohama and Kawasaki half-way to Tokyo, which is but eighteen miles from Yokohama. A motor bus route is to be operated between Hiratsuka and Atsuji, in Kanagawa prefecture. Six machines will be needed for this last-mentioned service.

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"CABBY'S" LAST STAND.

THESE are evil days for the horse-cab driver. Not merely does the motor cab, of which there are now many thousands in regular service, outdistance and outspeed his vehicle, but he finds himself compelled to use the taximeter in order to silence the outcries of his commercial enemies who make capital out of his traditional propensity to roguery. It is a sad sight we witness—Jehu reduced to the extremity of endeavoring to earn a livelihood by honest means. Having vainly fought against the idea of equipping his vehicle with a time and distance receiver, he now embraces it in the hope that a tardy show of business integrity will save him from extinction.

In New York, where taximeter motor cabs are certain to be quite plentiful before another twelvemonth has passed—hundreds are in service today—there is a distinct feeling of uneasiness among the horse cab proprietors and drivers. Their patrons are deserting and daily receipts are dwindling. In despair over the outlook proprietors and drivers are ready to consider any proposal which will give a filip to their business or check the rush of the public to motor cabs. A couple of years ago, when the taximeter motor cab was put in service a deputation of horse cab owners crossed the sea to ascertain what potential mischief the time and distance recording instrument could work to their business. We are not certain whether as a result of this excursion they damned the thing with faint praise, or faintly praised the damned thing. But it is of record that the trade organization represented by these pilgrims voted solidly against equipping horse cabs with taximeters or any other device which might cause shame to stain the cheeks of honest drivers. A little later, when the motor cab so equipped began to arouse the enthusiasm of the public, the horse cab proprietors repented of their hastiness, and soon the impression prevailed that it would be a good idea to use the instrument.

The London horse cab owners were the first to swing in line. The federation of associated proprietors now offers 30 per cent of the gross receipts to drivers who will fit a taximeter. This forebodes the beginning of competition with motor-propelled taxicabs.

The New York horse cab owners are now considering the adoption of the same expedient. They seem to apprehend that they must meet the competition of motor cabs, or quit the streets. It does not occur to them that the competition their lawless practices have provoked is not due to the employment of the taximeter, but to the presence of the motor cab itself, which has greater range, greater earning power, and is more cheaply maintained than a horse-drawn cab.

For some time past the inviolability of the taximeter has been under suspicion. The horse cab driver, however, does not turn from it on this account. Indeed, the possibilities for tampering with the instrument rather appeal to him. Many instances have come to the notice of the courts of late which indicate that the taximeter is not the perfect safeguard against dishonest practices which its makers have contrived to make us believe. It appears that it can be made to exhibit the fantastic vagaries of the gas and other meters. Time can be accelerated and mileage retarded. It is likely that this will ever be the case until the law provides a severe penalty for tampering with the devices after they have been certified accurate. Regular police examination and severe penalties for improper use of taximeters would give the public that measure of protection to which it is entitled. It is not enough for a city government to authorize the use of such instruments. Their accuracy in operation should be maintained by the civil power.

POSTAL WAGONS FOR GENERAL USE.

FOR several years the Progressive Postal League has been urging a reduction in the postal rates, and promises have been received by it that some needed reforms will be made at the coming session of Congress.

"One of the needs of the rural public," says the league's secretary, "is a motor wagon service that will relieve the country people from the necessity of employing special messengers or teams on individual errands. To test the possibilities of such a service we will ask for an appropriation of $60,000 to be expended in operating ten routes to be determined by the postmaster-general. The proposed service is to be equipped for the transportation of persons, produce and ordinary mail matter. The course for such a route would be 24 miles in length. To cover it would cost $5 a day. The tax on each family for the trip would not be more than five cents a day.

"If the average errands of each family were four a day, the service could be supported at the rate of five cents an errand. The system would make the rural post routes pay."

It is said that the postmaster-general favors the idea put forward by the Progressive Postal League. If he does he must have good reason for believing that the venture will prove profitable and practicable. But considering the public feeling in this country against governmental paternalism of any sort it is hard to believe that he entertains any serious thought of the postal department engaging in the work of common carrier. The Bavarian experiments in this direction are progressing favorably, the state-aided motor bus lines which carry parcels, passengers and mail being popular and successful in operation. It may be all right to lend state aid to such enterprises, but it is doubtful if any government, particularly one such as ours, would be warranted in carrying the whole burden of operation.

Motor wagons weighing, loaded, over nine tons are not permitted to operate on the streets of Nuremburg. No speed restrictions govern the travel of machines weighing, loaded, 3½ tons, but machines whose total weight is between that and 5 tons are not permitted more than 6¼ miles per hour, while those weighing from 5 to 9 tons are by law limited to 4½ miles an hour.

The Connersville Motor Transit Company has been organized with capital stock of $10,000 in Connersville, Ind.

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MOTOR DRIVEN FIRE APPARATUS.

IT is interesting to observe the rate of progress which is being made in European countries in the matter of supplanting horse-drawn fire apparatus by motor driven machines. It is correspondingly interesting to note the slowness of American municipalities to follow at the same pace. Considering that the chief purpose of a fire department is not to extinguish fires, but to prevent their spread, and remembering also that combustible building material is much more prevalent in American cities than abroad, it is not a little remarkable that the installation of fire apparatus which would reduce risk has not become a fixed policy with progressive administrations here.

If there was anything novel or experimental in the installation of motor fire apparatus there would be excuse for the dilatoriness of American municipalities in adopting it. But its economy and utility have been well tested. Hence the few motor driven machines which are in use in fire departments in American cities only denote that the experience of European cities with the same apparatus is either not well understood or else is not known at all. Otherwise it would be hard to account for our cities learning by their own experience what foreign fire departments have learned long ago.

From time to time we have had occasion to print descriptions of modern European fire service in which the installation of motor driven fire apparatus was a leading feature. Vienna, with its 59 motor driven machines, possesses the model fire service in the world today. A great many foreign municipalities not ranking any higher than Vienna have within the past three or four years been gradually replacing their horse-drawn equipment, until today there are scores of industrial centers of the first, second and third rank which are certain to be wholly supplied with motor driven fire apparatus within a very short time.

In a recent number of this paper the superior economy and utility of motor driven vehicles in the Hanover fire department was presented to readers. Our consular agent at Milan now reports that that city has employed motor driven apparatus in one form or another since 1901. One of its six machines, which was originally intended for carrying men to fires, was recently converted in character so as to be made more useful, it having been shown that the crew arrived at scenes of conflagrations so far ahead of the more important fire apparatus that they had to remain idle for some time until the latter arrived. On this account a small pump worked by the motor of the automobile was installed in order to deliver water as high as an ordinary fire engine could throw it. This pump weighs about 275 pounds. It is two feet long, one and one-fifth feet wide, and one and three-tenths feet high. The pump is so placed that no radical modification of the machine's construction was necessary. The maximum speed of this vehicle on the flat is 44 miles an hour. Usually it runs at 37 miles, manned by a crew of six men and carrying supplies, hose and first aid material. The pump delivers 500 quarts of water per minute.

Another motor vehicle in the service of the Milan fire department is operated by steam. Its wheels are 3 feet in diameter. The front wheels are fitted with single solid tires and the rear with twin solids. This vehicle is also intended for first aid service, being fitted with pumps capable of delivering 950 quarts per minute at a height equal to that which can be reached by an ordinary fire engine. The fuel is petroleum. The crew consists of six men. The mean speed is 15 1-2 miles per hour.

THE PARIS MOTOR BUS CONCESSION.

A committee of the Paris municipal council has recommended that an exclusive motor bus concession be granted for a period of 35 years to a company whose large vehicles shall carry 30 passengers. It is further recommended that the standard length of journey shall be 1 1-2 miles; that the outside fare for standard journey shall be 2 cents and inside fare 4 cents, with one cent additional for long trips; that 2 cent fare shall prevail for all journeys for workmen during certain hours of the day; that employes be paid a minimum wage of $28.80 a month; that they receive 10 per cent of the profits over 5 per cent; that they be not kept at work longer than 10 hours a day, and that they be pensioned according to service. The municipality proposes to take as its share 45 per cent of the profit above 8 per cent. There are six applicants for the concession, including the company at present exercising the monopoly in bus traffic

GASOLINE VAPOR HEAVIER THAN AIR.

A foreign exchange takes pains to correct the popular opinion that the fumes from gasoline are lighter than air and therefore ascend. As a matter of fact, it is declared, they are heavier than atmospheric air, no matter how dry or how wet the day, and irrespective of sunshine or fog. The vapor does not ascend; it descends and travels along the ground, diffusing itself in all directions if the ground is level, or sinking to the lowest point, such as the bottom of an inspection pit.

AN IMPORTANT MOTOR STAGE LINE.

A MOTOR stage route is to be established between San Diego and Ensenada in lower California. This will be the first line of any kind to connect southern California with that section of Mexico lying along the Pacific ocean. Wealthy ranch owners in and around Ensenada are back of the project.

Before the line can be operated bridges must be built, and the entire road must be put into shape. A franchise has been obtained from the Mexican government to operate the vehicles within its territory. At least eight bridges will have to be erected. The cost, however, will not be heavy, as the distances to be spanned are small. Once out of the Tia Juana canon the road lies along comparatively level ground and the expense of putting it into shape would be small. It is expected that the line will do much toward opening up the country around Ensenada, which is now practically unknown. The land is well adapted to fruit raising.

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ABOLITION OF THE PRIVILEGED CAB.

OPERATORS and patrons of motor cabs are considerably interested in knowing what is to be the status of such vehicles at railroad stations which heretofore have had the service of privileged horse cab companies. The motor cab appeals for custom on the score of greater speed and lower fares. Obviously, therefore, it would be poor judgment to debar it from places where its superiority over horse cab service could be well demonstrated. As, however, the railroad companies conducting their own horse cab service are well within their rights in excluding motor cabs from their depots, it remains to be seen how long they can continue to oppose the force of public opinion in the exercise of these proprietary rights.

It is instructive to observe the attitude of the English parliament on this question. In the draft of the new taxicab act the following significant clause appears:

ABOLITION OF PRIVILEGED CAB SYSTEM.—(1) In the admission of cabs to a railway station, or in the treatment of cabs while in a railway station, the company having the control of the station shall not show any preference to any cab, or give any cab a privilege which is not given to other cabs; and where any charge is made in respect of the admission of any cab to a railway station for the purpose of plying for hire therein, the charge made shall not exceed such sum as may be allowed by the Secretary of State.

(2) If it is proved to the satisfaction of the Secretary of State that it will not be possible to obtain a sufficient supply of cabs at a railway station for the proper accommodation of the public, unless the operation of this section is suspended or modified as respects that station, the Secretary of State may by order so modify or suspend the operation of this section with respect to that station, subject to such conditions as may be specified in the order.

(3) In this section the expression "railway station" includes the precincts thereof and the approaches thereto.

(4) Nothing in this section shall affect the liability of cabs or the drivers thereof to comply with any regulations or conditions which may be made by the company having control of a railway station for the purpose of maintaining order or dealing with the traffic at such station, including regulations as to—

(i) The number of cabs to be admitted at any one time;

(ii) The rejection of cabs and drivers unfit for admission; and

(iii) The expulsion of any cabman who has been guilty of misconduct, or of a breach of the company's bylaws or regulations.

There can be no doubt of the wisdom of this measure. While the privileged cab was drawn by a horse it was, perhaps, to the interest of the beneficaries of the system to maintain vehicles of a better grade than that of competing companies. The introduction of the motor cab, however, obscures the merit of the privileged horse drawn cab, and in the interest of good railway management the patrons of the road should be given the opportunity to make use of the vehicle which is best suited for their needs. It is proposed to abolish the privileged cab system in England on January 1, allowing four years for a test of the value of free and unrestricted motor cab competition.

Hotels and other institutions of semi-public character which exercise proprietary rights in the sub-letting of cab privileges are not in the same position as railroad companies, which usually own the land where their cabs are parked. Hotel cabs are ranked on the streets, which are open to all for traffic, subject to police regulations. Such arrangements as hotel managers may make with cab companies for the accommodation of guests should, therefore, be conducted without injury or inconvenience to the public.

Two motor bus routes lead out of Big Springs, Tex. One goes with mail and express to Sterling City, which is forty-five miles away. The other shoots off north to Lamesa, a distance of fifty-three miles.

Three Motor Wagons Which Do the Work of Six Teams.

MANY automobile makers who are more widely known for their keenness in prosecuting the sale of touring cars and runabouts than any other class of motor vehicle product are now gaining experience from the employment of motor wagons in their own business. A very considerable number have built trucks of one kind and another for private use within the past twelvemonth, and are realizing a very decided economy from their employment. This does not signify, however, that they are about to embark in the business of motor wagon manufacture. A comparatively small percentage of those who have put together such trucks have definitely done so with any other idea than that of gaining an immediate advantage in the matter of transportation. Others, like the Franklin Mfg. Co., of Syracuse, having determined to engage in the manufacture of motor wagons, employ the machines they build for the double purpose of keeping track of their economy and testing them in service which can be carefully measured. The above picture shows a group of gasoline wagons made by the Franklin company and used by it in its factory to perform the work of six teams. All of this company's local transportation is now performed by machines, and the service they render is so satisfactory as to create surprise even in an establishment which is well accustomed to expect economic results from the commercial motor vehicle.

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Information for Buyers

LONG TRIP FOR LIGHT WAGON.—A parcel wagon operated by a 14 hp. air-cooled engine made by the Waltham Mfg. Co., Waltham, Mass., was driven from the factory to New York in time to be exhibited at the second eastern national automobile show. Later it was sent to the Chicago show, also under its own power. Of the Waltham-New York trip the company's driver makes this report:

"The start was made from Waltham at 1:30 p. m. November 4, the load consisting of 875 lbs., which included three passengers. Springfield was reached at 6:30 p. m., a total of 89 miles in five hours. The start from Springfield was made at 6:30 Tuesday morning, and we traveled over excellent roads via Hartford, New Haven, Bridgeport and Stamford. We arrived at the New York branch of the Waltham Mfg. Co. at 2:10 p. m. The morning's run showed 155 miles, covering a total elapsed time of seven hours and 40 minutes. The total running time for the entire distance of 244 miles was exactly 12 hours and 40 minutes. We used 15 gallons of gasoline and one gallon of oil. During the entire trip from Waltham to New York we were off the high gear but four times as a result of bad roads or hills, and from one end of the trip to the other the wrench and screwdriver were not taken out, nor were adjustments of any nature made. The performance of the car could not have been more satisfactory.

"On Wednesday morning of the week following the show we commenced the return trip, carrying three passengers and a load aggregating 875 lbs. We stopped at New Rochelle one hour and a half to give demonstrations. New Haven was reached at 6:10 p. m., a distance of 80 miles from New York, the total run, including demonstrations, being nearly a hundred miles. At New Haven we took out the tool kit for the first time since commencing the trip from Waltham a week and a half before, and it was for the purpose of putting in a new set of batteries. We proceeded by moonlight to Waterbury, arriving at 9:50. When leaving New Haven we decided to give the car an unusual test, taking what is known as the old stage road to Waterbury over the mountain. This road is extremely rough and rocky, and very steep. The wheels slipped repeatedly, and it was only by putting rocks under the wheels and jumping the car ahead a yard or so at a time that we were able to get up the hill at all. It was the worst and steepest hill that I have ever driven a car over during my entire experience. It was worse than Prospect hill near Waltham, which is regarded as one of the hardest tests of the hill-climbing qualities of a car that can be found within 50 miles of Boston. If there had been any doubt in my mind about the friction holding under severe conditions, they were dissipated for all time by this test. We resumed our homeward trip at noon Thursday. We had good, bad and indifferent roads to Springfield. The following morning the run from Springfield to Waltham, 89 miles, was made in five hours and ten minutes, including the stop for lunch. Upon our arrival at the factory we weighed in and found the car itself with its equipment weighed 1,600 lbs., and with its full load, as it had made the entire trip, weighed 2,475 lbs. The following day the mechanism was removed and examined, and all parts were found intact. The high-speed bevel friction surfaces showed very slight wear."

* * *

THE USE OF SPECIAL STEELS.—"The craze for special steels," says Hayden Eames, the general sales manager of the Studebaker Automobile Company, "is a phase through which the automobile industry at the present time is passing. It is held out as a general panacea for all ills, without care or thought as to its proper application. The automobile engineer cannot follow formulas which hold good for a large stationary engine and which do not hold at all

The Victor and the Vanquished.

ONE day last month the interesting spectacle shown in the above picture was observed on Broadway in New York. H. B. Claflin & Company, the well-known dry goods merchants of that city, recently bought three big electric Studebaker trucks to supplement the work of three other machines of the same size and make which they purchased some time ago. In making delivery the Studebaker representatives loaded a team of Claflin's horses into one of the new electrics, hitched the discarded wagon on behind, and pulled the whole horse outfit down Broadway from Forty-eighth street to the Battery. The public was highly edified by the comical sight. The electric trucks are geared to travel 7 miles an hour. Each weighs 8,400 pounds.

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for the modern high-speed motor. The practices of modern automobile construction have been largely those of adaptation. They are, in every sense of the word, empirical, and the factor of safety is sometimes as high as 200 or 300. That special steels have their place in automobile engineering is undoubtedly a fact, but if they are to be valuable, if they are to bring anything to the automobile industry, it must be done by the elimination of weight. A car which claims a special steel for every part, when the designer has no knowledge, or to put it plainly, when there is no knowledge to be obtained that each is particularly adapted for this part, is experimenting. To be more explicit, if a 50-point carbon steel has been found by practice to be sufficiently strong for a certain part, then nothing is gained by replacing it with a special steel unless the weight is actually reduced, and so far as I have been able to judge, this has not been accomplished.

"From an advertising point of view, the special steel proposition sounds attractive to some people. It is a talking point pure and simple. To illustrate my meaning, the Studebaker chassis is composed of steels which have been adopted and which have proved satisfactory by the best foreign manufacturers. In building, it has been our aim to produce as light a car as is consistent with strength. Comparing this chassis with other cars using so-called special steels, in almost every instance we have found our chassis to be lighter. Therefore, why make any change? The only admitted value of any special steel is to reduce weight by substituting something which is lighter and of equal strength, but this does not seem to have been done. If a bar of steel tests a certain per cent stronger than a similar sized bar of other material, and the size is reduced on these figures alone, it does not follow that the smaller bar is going to stand up in the various stresses to which automobile parts are subjected.

"I do not want to be understood as decrying the use of special material, but I do most emphatically disapprove of blindly substituting something which is comparatively unknown, for something which has been tried by practice. Since practice only can determine its worth, I am not disposed to place any particular value upon a car composed of special steels which weighs no less than an automobile built of materials which have been proved by time and experience to be satisfactory."

* * *

CODE OF BEHAVIOR FOR DRIVERS.—The Firestone Tire and Rubber Company is distributing a hanger to all who own industrial motor vehicles whereon is printed these articles of drivers' allegiance to the employers' interest:

(1) I will not over-load or over-speed my vehicle, because this will be harmful to the mechanism and tires. I realize that a good rubber tire has a certain amount of "life" and if persistently overworked it cannot recover.

(2) I will always keep the brakes working evenly and the axles and wheels "trued up." I can thereby save rack and wear on my vehicle and prevent unnecessary strain on any one of the tires.

(3) I will not allow oil or grease to accumulate on my rubber tires, as this will eventually cause decay.

(4) I will never expose my tires to burning heat as the wear-resisting properties of the rubber would thus be destroyed.

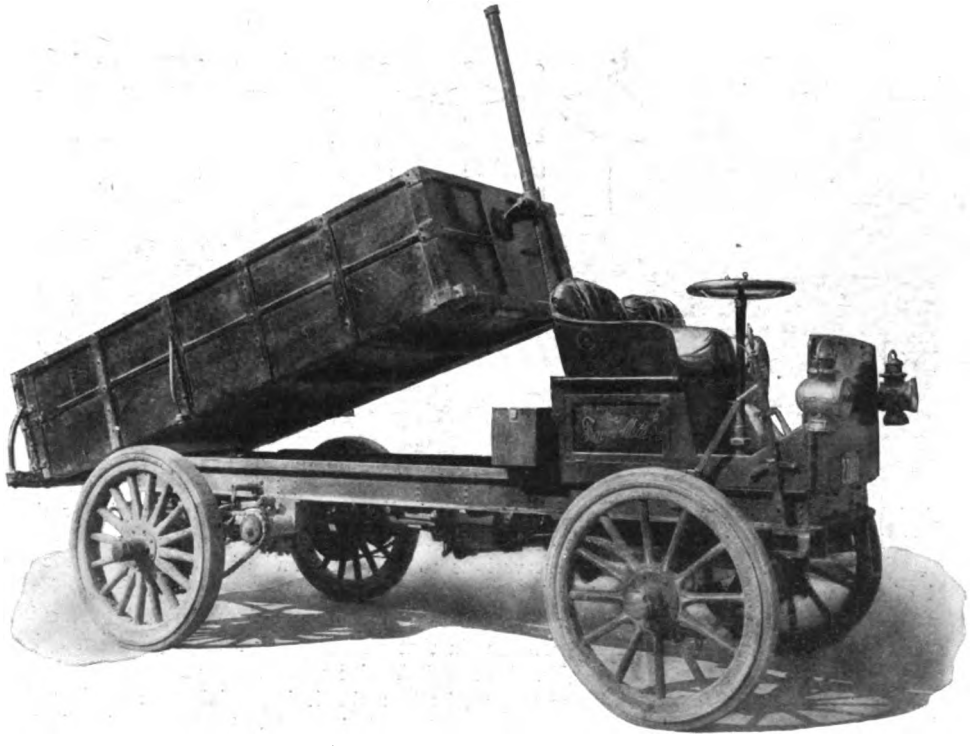
(5) I will always remember to start my vehicle in a straight line before turning the steering wheel; because by turning front wheels when vehicle is standing still, a heavy and unnecessary strain would be placed upon the tires.

(6) I will start and stop my vehicle gradually and avoid jerky motions under all circumstances.

(7) I will not persist in running my vehicle along street car rails, as that would grind down the edges of the tires.

(8) I will always, when possible, choose a smooth pathway, avoiding obstacles and road irregularities; and will cross car tracks preferably at an angle.

(9) As merely resetting or repairing a tire will in many cases double its life, I will have my tires attended to promptly when damaged, in order to secure the greatest amount of service from them.



Oscar Lear Company's Tipping Body.

THIS body is equipped to carry coal, crushed rock, sand, or other material of the sort. It is hinged to the rear of the frame. The forward part of the body is designed to be elevated by a worm and screw operated by the driver from the side of the vehicle. The load, therefore, can be dumped through the tail gate. The body is lined with sheet metal and is made in a very substantial manner. The running gear is the Oscar Lear company's regular 24 h. p. truck, equipped with air cooled motor, sliding gear transmission, double chain drive, 36 or 38-in. wheels fitted with 4-in. tires in front and 5-in tires in the rear. The capacity of the body is three tons.

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LOGAN AGENTS IN NEW YORK.—The John N. Loeser Mfg. Co. will continue to act as agents for the Logan Construction Company in New York City and vicinity during the 1908 season.

* * *

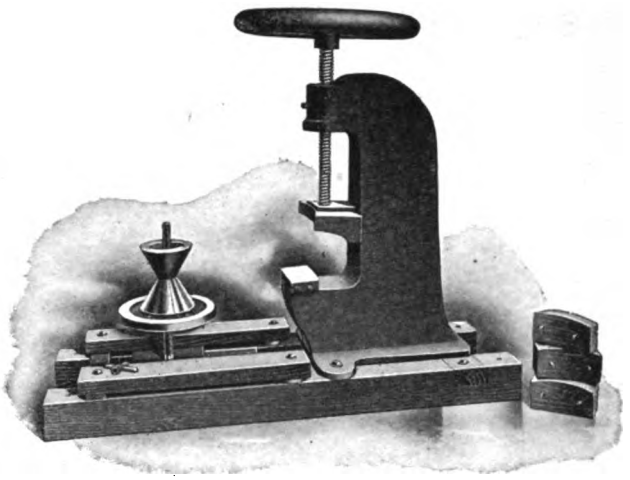
LOGAN DISTRIBUTING AGENTS.—The Commercial Auto Company of Milwaukee will be distributors for the Logan company in the state of Wisconsin during the 1908 season. They have secured temporary quarters at 1103 Grand avenue, and have already taken on for demonstration purposes a full line of Logan wagons.

* * *

VARIETY OF RAPID VEHICLES.—Within the last year the Rapid company has built and sold its product as hospital and police ambulances, hotel busses, fire department chemical and hose wagons, telephone line-gang wagons, trolley line emergency repair wagons with tower, etc. It owns and operates a body making plant, and makes all its own tools and parts. The upholstering, painting and finishing are also done in the Rapid plant, which is the largest devoted exclusively to the manufacture of commercial gasoline motor vehicles.

* * *

TIRE MOUNTING MACHINE.—At the Chicago motor wagon show the Hartford Rubber Works Company, Hartford, Conn., gave many demonstrations of its tire mounting machines just put on the market. The machine is constructed to remove heavy tires from wheels and also mount them on wheels. This it accomplishes very quickly and satisfactorily. It should prove very useful to makers of motor trucks and wagons.

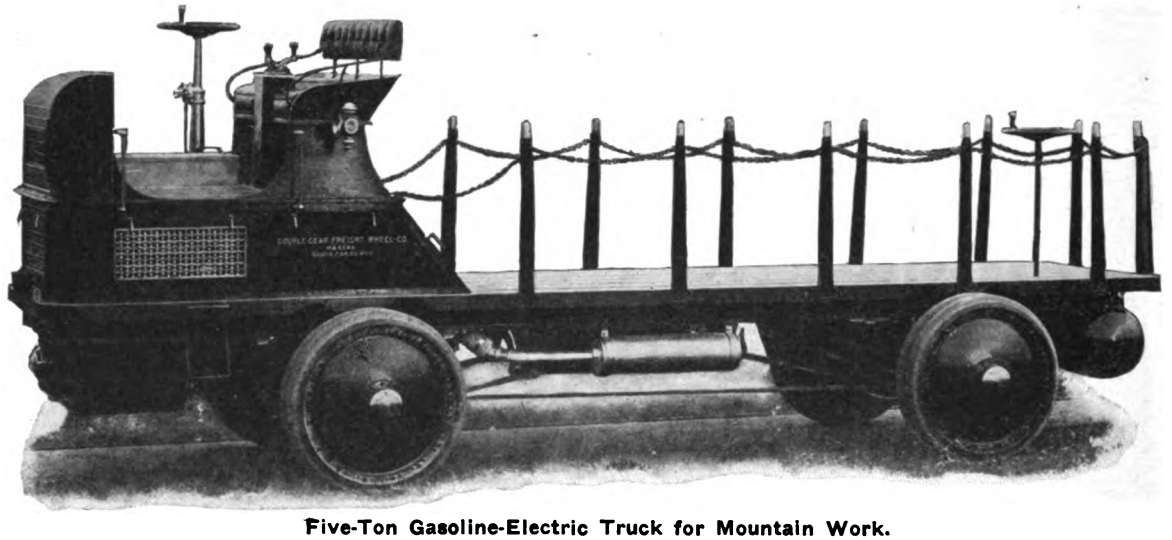


Hartford Rubber Co.'s Tire Mounting Machine.

* * *

ATLAS TRUCKS IN TRANSFER WORK.—The Knox Motor Truck Co., Springfield, Mass., recently delivered three 3-ton trucks to the Mutual Transfer Company, of Hackensack, N. J. and New York City. These trucks are run on regular daily trips between New York and Ridgewood, N. J., for suburban deliveries, covering fifty miles per day, each doing the work of three or four double teams.

SUPPLEMENTARY SPIRAL SPRINGS
GRAHAM PATENT
Teaming Without Breakage
Save your tires, your engine, your patience and nerves. Booklet 15 free.
Supplementary Spiral Spring Company
780 Broadway, New York (near 59th St.)



Five-Ton Gasoline-Electric Truck for Mountain Work.

THE Couple-Gear Freight Wheel Company, of Grand Rapids, Mich., recently built a 5-ton truck for the Carnegie solar observatory at Pasadena, California, the machine being used to haul astronomical apparatus up the heights of Mount Wilson. The present location of the station does not permit the best observations to be taken, and on that account the directors have long been considering the removal of the apparatus to the mountain heights towering above. The great weight of many of the components of the huge telescope, and the precipitancy of the ascent, called for the employment of mechanical power in moving the apparatus. The truck chiefly differs from the regular product of the concern in that all four motor road wheels are driven by power furnished by a gas engine and generator, instead of storage batteries. The trail is nine miles long, and in that distance reaches to a height of one mile. Many of the turns are so extremely short as to practically make it impossible to negotiate them without steering all four wheels. In addition to the regular mechanical brakes this special truck is equipped with an electric brake which converts the motors into generators, passing the current generated through three points of resistance. This feature was necessary because of the otherwise severe tax on the driver during the long descent and as an additional safeguard. This truck can be turned around in a space of twenty-three feet without backing, the rear wheels following exactly in the track of the forward wheels the same as on a straight course, and steering can be done equally as well in either direction. The steering device for the rear wheels is an exact duplicate of that used for the forward wheels, and all four wheels turn at the same time and from the same hand wheel. There is a brake on every wheel and each pair is operated independently. The rear wheels may also be locked and steering effected from the front wheels only. In the oblique steer the four wheels are all turned in the same direction.

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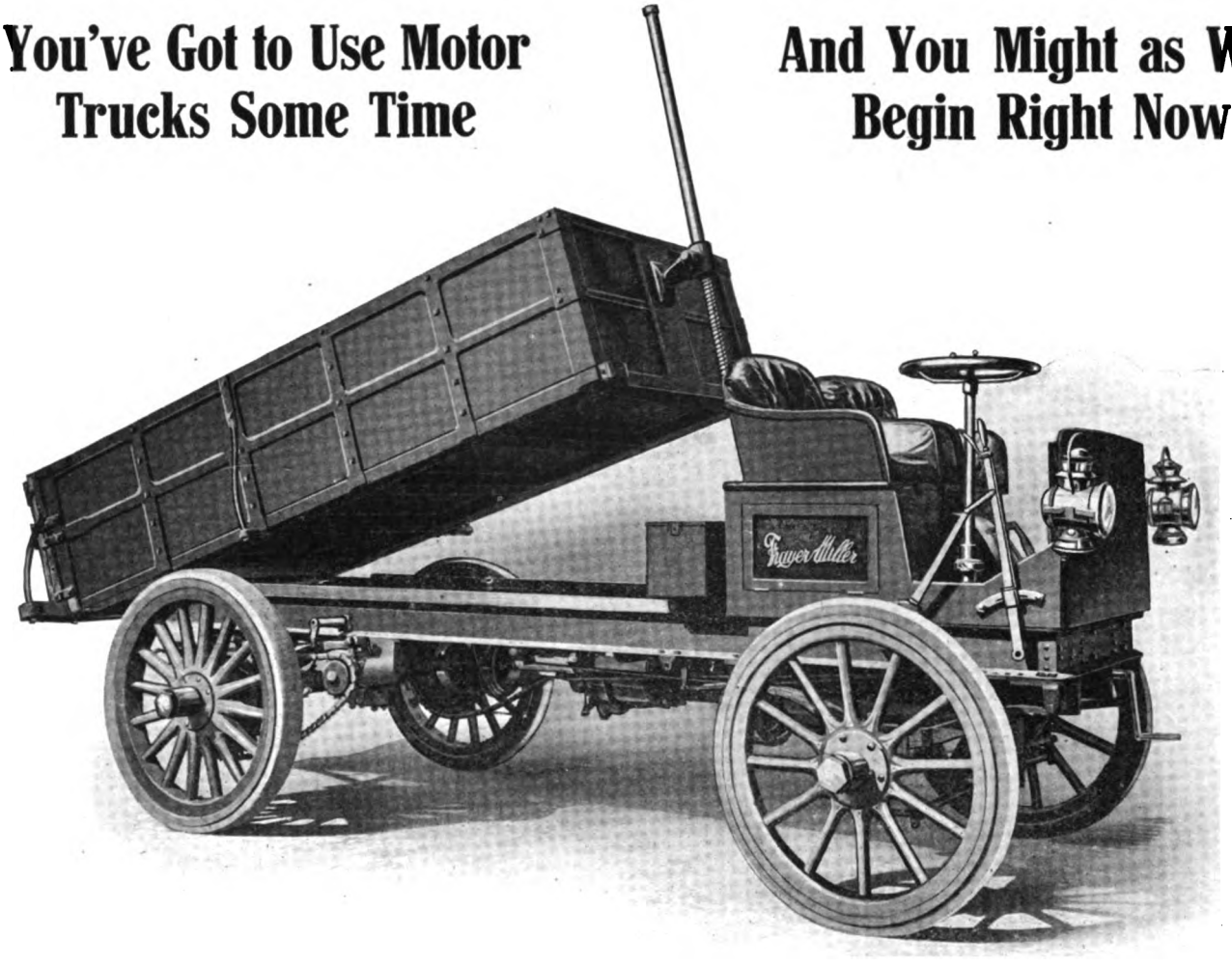
You've Got to Use Motor Trucks Some Time

And You Might as Well Begin Right Now



Regardless of the loads you have to transport, the Frayer-Miller Gasoline Truck will do your work economically and expeditiously.

Regardless of the approaching cold weather, it will do it continuously. Its four-cylinder engine is positively air-cooled. It works more satisfactorily in winter than a machine whose power plant is water-cooled. No freezing of the circulation. No radiator troubles. No interruptions to service—for which you have to pay.

Regardless of what any prejudiced person may say, the motor truck—and particularly ours—will haul merchandise cheaper than horses if there is enough work for it to do. If there isn't enough work for the machine, stick to your draft animal transportation.

Regardless of street conditions, the motor truck is a money maker. Street surfaces which are bad for motor wagon traffic are still more destructive to draft animals. Large wheels and large tires ease the road shocks to Frayer-Miller trucks.

If you want a powerful truck with a reliable engine, one which will give you or your drivers the minimum of trouble and the maximum of satisfaction, which affords easy access to all working parts and is cheaply maintained if intelligently cared for, then you want to consider ours.

If you want the other kind—but that is impossible.

Figure it out for yourself; or let us help you to decide what your equipment should be. You may not know that there is more to be considered in the matter of employing motor trucks than the mere selection of vehicles. There is, nevertheless. Much more.

See our models at the Chicago Motor Wagon Show, now in progress. Bodies to order.

Oscar Lear Automobile Co., SPRINGFIELD, OHIO

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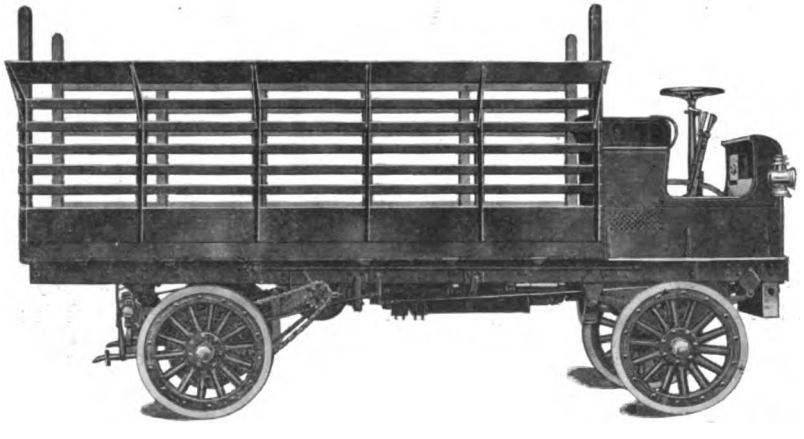
3 and 5 Ton

BODIES TO SUIT REQUIREMENTS



AMERICAN MOTOR TRUCK COMPANY

"WE DELIVER THE GOODS"

LOCKPORT, N. Y.

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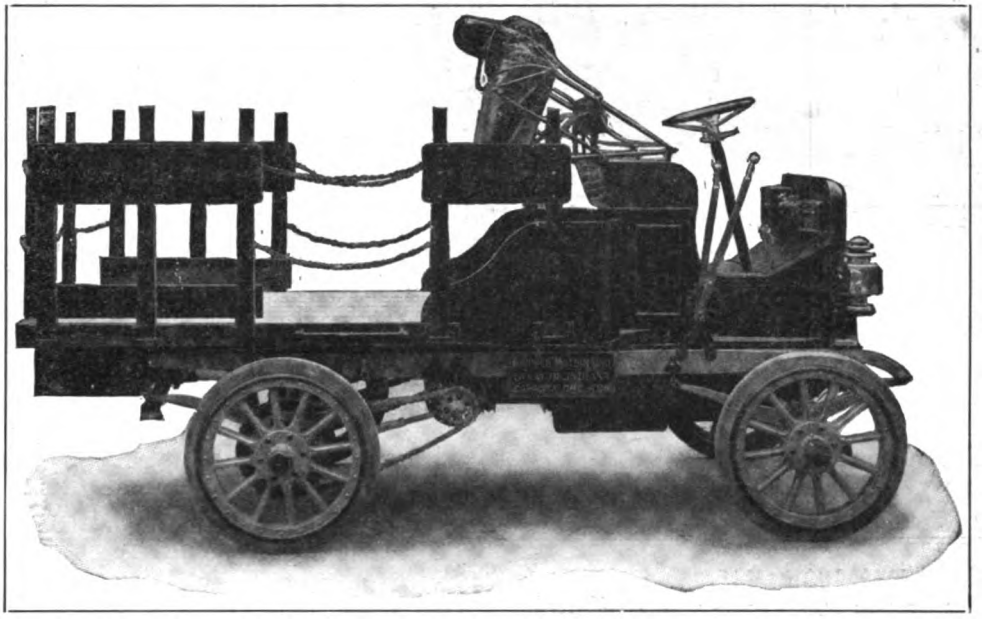
ECONOMY—COPPOCK

BUILT TO LAST **Years** NOT DAYS



ONE TRUCK DISPLACES THREE TEAMS

Cost of operation—less than 2 cents per mile.

It makes no difference what other commercial cars you have tried, without satisfaction—THIS is the ONE you have waited for, and will buy.

YOU WILL WANT PROOF.

All right. 30 to 60 days' trial in your own service, and you keep the tab. We solicit correspondence and will furnish full particulars and details.

COPPOCK MOTOR CAR CO.

FOURTH STREET, DECATUR, IND.

CARL HOLDREGE, Sales Manager :: :: :: 317 Railway Exchange, CHICAGO

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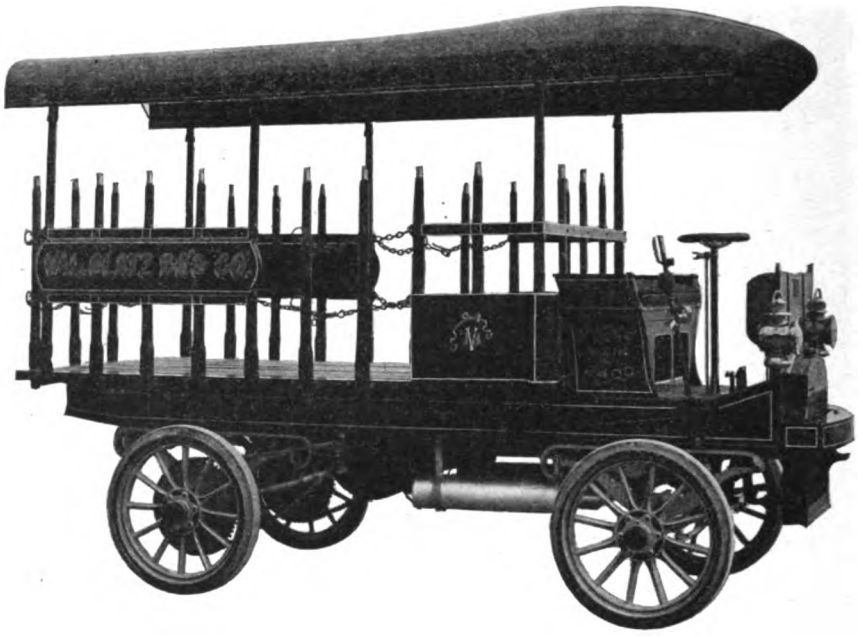
ONE, TWO,
AND
THREE TONS

THIRTY
HORSE POWER

FORWARD
AND
REVERSE SPEEDS
FROM
1 TO 10 MILES
PER HOUR

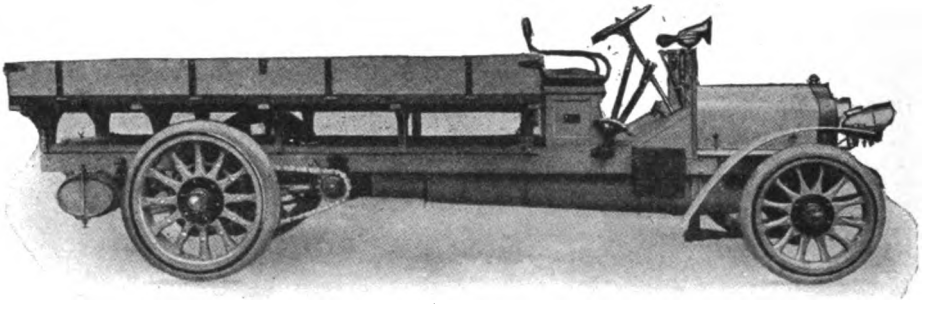
CAN NOT BE
OVERSPEEDED

THE MEISELBACH TRUCKS



FRICTION DRIVE—PERFECTLY SUPPORTED ALL WHEELS ON TIMKEN ROLLERS
POWERFUL BRAKES—THE SIMPLEST AND EASIEST CONTROLLED TRUCKS YET SHOWN

THE A. D. MEISELBACH MOTOR WAGON CO., North Milwaukee, Wisconsin



The "SAFIR" 4-Ton Truck

Its 1907 Record

First Prize, Gold Medal, Swiss Reliability Trials, May 9-14 (17 Competitors.)
First Prize, Gold Medal, International Commercial Vehicle Trials, Vienna, Oct. 7-12, for minimum fuel consumption, (52 Competitors.)

This truck is especially economical in operation and maintenance. The Saurer carburetor assures economical fuel consumption and obviates sudden speed variations. The gradual effects of the Saurer motor brake keeps tire wear at the minimum. The Saurer self-starting appliance, invaluable in congested traffic, enables the driver to start the engine withour leaving his seat. Chrome nickel steel for all transmission members. Parts very accessible and easily demounted. Engine develops 30 hp. at 1000 revolutions per minute.

For further information address:

THE COMMERCIAL MOTOR CAR COMPANY

Times Bldg., 42nd and Broadway :: :: NEW YORK CITY

CHICAGO OFFICE: 414 First National Bank Building

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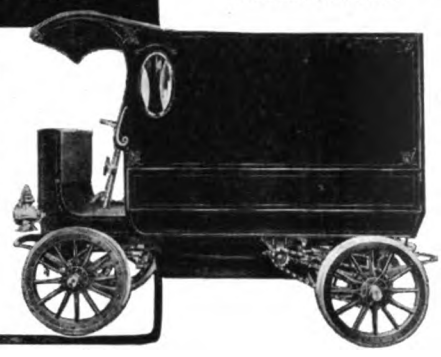
The Rapid Future

SIGHT-SEEING CARS 12 TO 25 PASSENGER.
ANY STYLE OF DELIVERY CAR.
SEVERAL MODELS OF TRUCKS.
ANYTHING DESIRED FOR SPECIAL SERVICE.



Is the commercial car's future and you know what that is. If you are capable of managing a rapidly developing permanent agency for the best commercial cars in the world, write me for our new catalog, and state your facilities for an energetic selling campaign to back up our steady national advertising. We are not interested in the "one season" class, but we do solicit correspondence from responsible agents of ability. **Our exhibit at the Chicago show is the largest ever given by any commercial car manufacturer.** We "do things" in one way only.

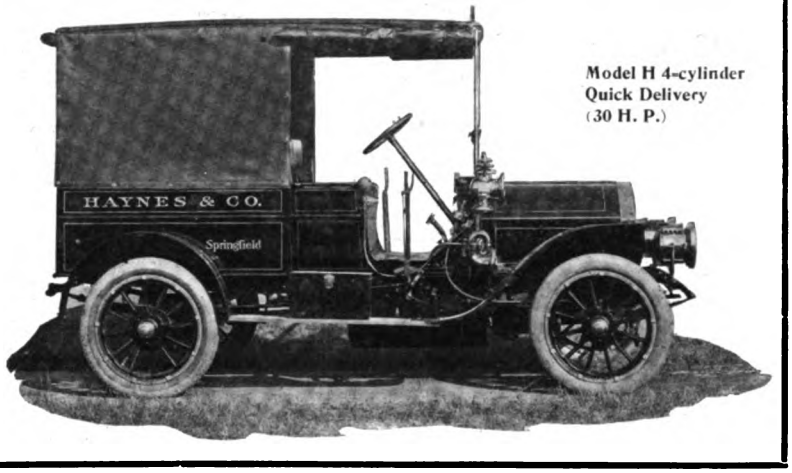
A. O. HENRY, Sales Manager
RAPID MOTOR VEHICLE CO. PONTIAC, MICH.

KNOX Commercial Cars
Air-Cooled Motors

Knox Commercial Cars have proved to be the most reliable and satisfactory on the market, and bring results that are impossible with horse wagons, besides a great saving in time and expense.

AGENTS will find our commercial line a valuable asset, easy to interest buyers in and little competition. Write us.

All styles, capacity 600 to 6000 lbs.



Model H 4-cylinder
Quick Delivery
(30 H. P.)

Knox Automobile Company
SPRINGFIELD, MASS.

TRADE MARK TRADE MARK

GOODRICH RUBBER
EQUIPS THE PHAETON OR MOTOR TRUCK EQUALLY WELL

Lively under big or little loads; no tendency to smash down and positively no disintegration on account of brittleness

GOODRICH SOLID RUBBER TIRE QUALITY
IS STILL ON THE TOP SHELF

The B. F. Goodrich Rubber Company
AKRON, OHIO

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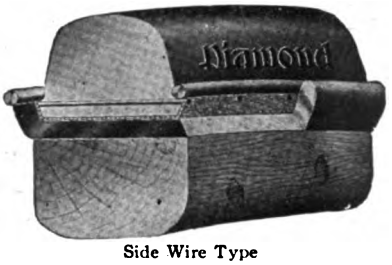

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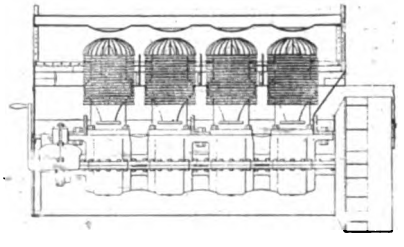

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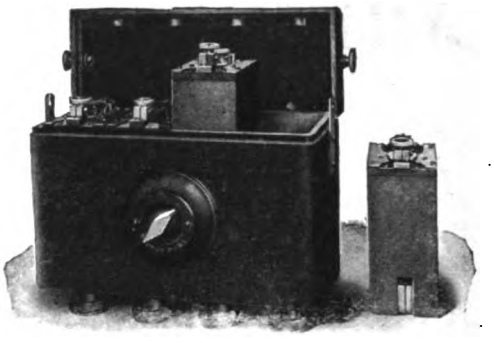

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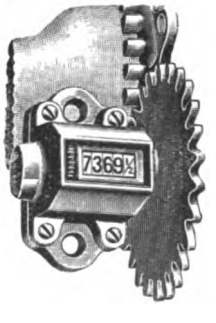

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